# SANATANA DHARMA COLLEGE
# ALAPPUZHA


## AQAR 2021-22

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# *Phyllanthus sanatanadharmae* (Phyllanthaceae): a new species from southern Western Ghats, India

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## Abstract

A new species of *Phyllanthus* (Phyllanthaceae: *Eriococcus*), *P. sanatanadharmae,* from the southern part of Western Ghats, India is described. Detailed taxonomic description and colour photographs are provided along with key to the section *Eriococcus* in Kerala region of Western Ghats.

**Keywords:** Kerala, *Phyllanthus* sect. *Eriococcus*, Taxonomy

## Introduction

*Phyllanthus* Linnaeus (1753: 981) is recognized as largest genus in the family Phyllanthaceae, comprises about 1000 species (Bouman *et al.* 2018; POWO 2021), distributed mainly in tropical and subtropical regions (Radcliffe-Smith 2001; Webster 2014). Among them, more than 50 species occur in India and of which, 28 species in Kerala region of south India (Balakrishnan & Chakrabarty 2012; Sasidharan 2013; Naveen *et al.* 2015; Sunil *et al.* 2016).

While exploring the floristic diversity of Vellarimala Forests of Kozhikode District, Kerala the authors came across an unknown species of *Phyllanthus*. Critical analysis of the literature (Roxburgh 1832, Hooker 1887, Trimen 1898, Gamble 1925, Webster 1994, 2002, Airy Shaw 1969, 1981, Rossignol *et al.* 1987, Govaerts & Radcliffe–Smith 1995, Philcox 1997, 1999, Chen & Wu 1997, Govaerts *et al.* 2000, Chaudhary & Rao 2002, Viswanathan *et al.* 2002, Balakrishnan & Chakrabarty 2007, 2012, Murukan *et al.* 2008, Sasidharan 2013; Sunil *et al.* 2016), as well as from the scrutiny of vouchers deposited in K, NY, PE, MH, CAL, TBGT and CUBH revealed that the specimens do not match any of the previously described species. These specimens are sufficiently distinct to warrant taxonomic recognition as new species and is here described as *P. sanatanadharmae sp. nov.*

## Taxonomy

*Phyllanthus sanatanadharmae* J.Mathew & Yohannan, *sp. nov.* (Fig. 1)

Type: India. Kerala, Kozhikode District, Vellarimala, Way to REC Para, altitude 2250 m a.s.l., 14 April 2016 , *Jose Mathew 5041* (holotype: MH ; isotype: MH.)

Diagnosis: *Phyllanthus sanatanadharmae sp. nov.* is morphologicaly shows some affinities with *P. megacarpus* (Gamble 1925: 332) Kumari & Chandrab. (1987:238), but differs by its diffusely branched growth habit up to 300 cm in height (vs. undershrub habit up to 100 cm high), coriaceous leaves with recurved margins (chartaceous leaves without recurved margins), pinkish white sepals with fimbriate margins (vs. purple sepals with deep ridged dentate margins), and depressed globose capsule (vs. inflated, obovoid or subglobose capsule).

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# Two new species of *Piper* (Piperaceae) from the southern Western Ghats and the taxonomical status of *P. megacarpum*

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Mathew J., Pichan S., Madhavan R. & Sarojini U.S. 2022: Two new species of *Piper* (Piperaceae) from the southern Western Ghats and the taxonomical status of *P. megacarpum*. — *Ann. Bot. Fennici* 59: 33–39.

*Piper kurichyarmalamum* J. Mathew & P.M. Salim and *P. ovalifructum* J. Mathew & P.M. Salim (Piperaceae) from the southern Western Ghats, Kerala, India, are described as new species based on morphological data. Diagnostic morphological characters, distribution and images of these species are presented, along with a key to species of *Piper* section *Muldera* (clade *Muldera*) in India. *Piper megacarpum* J. Mathew is synonymized with *P. galeatum* (Miq.) C.DC.

*Piper* is the largest genus in the Piperaceae, comprising ca. 2000 species distributed in the tropics (Marquis 2004, Quijano-Abril *et al.* 2014, Mukherjee 2016, 2018, Asmarayani 2018). More than 600 *Piper* species were considered Asiatic elements (Wallich 1824–1849, Blume 1826, Hooker 1886, de Candolle 1910, 1912, 1923, Ridley 1924, Backer & Bakhuizen van den Brink 1963, Long 1984, Huber 1987, Gardner 2006, Suwanphakdee *et al.* 2012), with ca. 100 species in India (Mathew *et al.* 2017). Samaglia (2016) and Mathew *et al.* (2017) recently added several taxa to the genus, resulting in ca. 20 species currently recognized for the state of Kerala in the southern part of the Western Ghats.

Species of *Piper* section *Muldera* are dioecious and have cupullate, fleshy bracts. Hooker (1886) recognized five species in this section (*P. galeatum*, *P. maingayi*, *P. pachyphyllum*, *P. schizonephros* and *P. trichostachyon*) in the *Flora of British India*. However, Lekhak *et al.* (2014) noted that "*P. maingayi*, *P. pachyphyllum*, and *P. schizonephros* do not occur in present-day India. The former is known from Singapore and Malacca and the latter two from Malacca only". Recently, two species — *P. relictum* (Lekhak *et al.* 2012) and *P. dravidii* (Lekhak *et al.* 2014) — were described from the northern Western Ghats. During our botanical explorations in the southern Western Ghats (Kerala) in 2018–2021, some

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# *Seidenfia manikathila* (Orchidaceae, Epidendroideae, Malaxideae), a new species from south Western Ghats, India

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**Abstract.** *Seidenfia manikathila* J.Mathew, P.M. Salim & Szlach. (Orchidaceae), a new species from the southern Western Ghats, Kerala, India, is described and illustrated based on morphological data. We demonstrate that the new species differs from other *Seidenfia* species both in vegetative and floral characters. The diagnostic morphological characters, distribution and images of the new species are presented in this paper. Images and key to the known species of *Seidenfia* coming under the section *Seidenfia* from India (*S. densiflora*, *S. intermedia*, *S. malabarica*, *S. rheedi*, *S. versicolor*) is also provided.

**Key words:** *Crepidium*, Malaxideae, *Seidenfia*, India, Kerala, southern Western Ghats, floristic studies, new species

## 1. Introduction

The genus *Seidenfia* Szlach., an Afro-Asian element (Orchidaceae, Epidendroideae, Malaxideae) comprising 9 species, was previously reported from India, Sri Lanka and Seychelles. Morphology and the gynostemium structure of *Seidenfia* is similar to that of *Crepidium* Blume, but these genera are easily differentiated based on the flower structure, particularly lip morphology. Margońska & Szlachetko (2001) pointed that "*The lip of Seidenfia is not auriculate; its basal part is channeled, forming a kind of claw with thickened margins; the lamina is widely and abruptly expanded above the channel, and the lamina margins are more or less denticulate*". They categorized 9 species coming under the genus *Seidenfia* into two sections, viz. *Crenulatae* Szlach. & Marg. with 1 species *S. crenulata* (Ridl.) Szlach. and *Seidenfia* (Sw.) Szlach. with 8 species: *S. densiflora* (A. Rich.) Szlach., *S. discolor* (Lindl.) Szlach., *S. intermedia* (A. Rich.) Szlach., *S. lancifolia* (Thwait.) Szlach., *S. malabarica* Marg. & Szlach., *S. rheedii* (Sw.) Szlach., *S. seychellarum* (Kraenzl.) Szlach. and *S. versicolor* (Lindl.) Marg. & Szlach.

So far 5 species of *Seidenfia* from the section *Seidenfia* (*S. densiflora* (Fig. 1A-B), *S. intermedia* (Fig. 1C), *S. malabarica* (Fig. 1G), *S. rheedii* (Fig. 1F), and *S. versicolor* (Fig. 1D-E), were reported from India. In a recent botanical exploration to the Idukki District (Fig. 2) of southern Western Ghats (2019-2021), some interesting specimens from the section *Seidenfia* were collected. Critical analysis of the literature as well as herbarium specimens revealed that the collected specimens do not match the previously described species. This has resulted in the recognition of a novel species that is described here as *S. manikathila.*

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# *Chiloschista confusa* (Orchidaceae), a new species from the southern Western Ghats, Kerala, India

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*Chiloschista confusa* M.J. Mathew, J. Mathew, P.M. Salim & Szlach. (Orchidaceae), a new species from the southern Western Ghats, Kerala, India, is described and illustrated based on morphological data. It has long been misidentified as *C. fasciata*, an Indo-Sri Lankan species. However, *C. confusa* differs from *C. fasciata* by its denser inflorescence with comparatively smaller flowers, glabrous inflorescence, pedicel and ovary, flattened callus disc with eglandular hairs, and protuberance of the spur. A key to the three species of *Chiloschista* known from south India (*C. confusa, C. fasciata, C. glandulosa*) is also provided.

The orchid genus *Chiloschista* comprises about 30 species distributed in the Indian subcontinent, Himalaya, China, Taiwan, Thailand, Indonesia, Australia, New Guinea, Fiji and Micronesia (Seidenfaden & Wood 1992, Comber 2001, Averyanov *et al.* 2018, Gyeltshen 2020; *see* also http://www.plantsoftheworldonline.org/). Hitherto available collections from south India have been identified as *C. fasciata* (Figs. 1 and 2) and *C. glandulosa* (Fig. 3). The basionym of *C. fasciata*, *Sarcochilus fasciatus* (von Mueller 1866) was based on Wight's (1852: 1741) description and illustration (as "*S. usnioides*") of a specimen collected from Malabar. The description reads "*Malabar, on branches of trees, flowering in April. low herbaceous, hairy, leafless, epiphytes: roots flattened, green, as if to supply the absence of leaves by performing their functions. Spikes erect, flowers whitish or somewhat cream-coloured. The lip of this plant is curious and difficult to represent. I am not sure that this is the species named, but I have no means of satisfying myself on that point*". Later Hooker (1890: 37) described *Sarcochilus wightii* based on the same illustration by Wight. Hooker (1890: 37) also described *S. minimifolius*, a morphologically similar species from Sri Lanka. Seidenfaden (1995a) solved the problem by validating *C. fasciata* and including the above-mentioned names in it. Thus *C. fasciata* is considered an Indo-Sri Lankan species.

Seidenfaden (1995b) pointed out that Hooker (1890) was probably misled by Lindley's (1833: 237) note on *Oeceoclades retzii* when using

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# Ecological Study of Blue Green Algae of Canal Waters in Alappuzha, Kerala

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**In the present study five important canals of Alappuzha were analysed for algal distribution viz. Kottaram Canal, Alappuzha – Cherthala Canal, Commercial Canal, Vadai Canal and Uppootti Canal. Algae, the principle primary producers are photosynthetic thallophytes, usually are microscopic, unicellular and colonial or multicellular. The Canals contain different types of Phyco-components like planktons, benthos, epiphytic organisms etc. The algal taxa from Class Chlorophyceae, Bacillariophyceae and Cyanophyceae were found in these canals Totally 23 species of algae were recorded from the study sites. Among them maximum number of species (7 species) was recorded from Vadai canal followed by Alappuzha-Cherthala canal (6 species), and Kottaram canal (4 species). Members from Class Chlorophyceae were found dominant followed by Class Bacillariophyceae and Cyanophyceae. Three among these canals were showed Physico chemical parameters at the favourable limit and two were rich in nutrients, because of the discharge of effluents from the industrial area which is Alappuzha-sherthala canal and Vadai canal because of the discharge of effluents from the industrial area which is Alappuzha-Cherthala canal Vadai canal.**

**Keywords: Distribution, Biodiversity, Physico-chemical parameters, Epiphytic, Eutrophication.**

## INTRODUCTION

Alappuzha, one of the southern districts in Kerala, lies mostly in the coastal plains. Agriculture is the predominant economic activity with paddy being the main crop. Alappuzha is well known as a tourist destination of international acclaim. The extensive navigable waterbodies with the unending stretch of paddy fields and green coconut palms on the polders, streams, canals, rivers and backwaters and long stretch of unbroken calm sea coast make it an ideal tourist spot. Alappuzha is located at 9.540 N 76.400 E. The average elevation is 1 m (3.3 ft.) Alappuzha covers an area of 1,414 square kilometres and is flanked by 2,195 square kilometres of Vembanad lake, where six major rives spread out before joining the coast line of Alappuzha. The city of Alappuzha is crisscrossed by a system of canals, which is a part of the National Waterway, Alappuzha is one of the first planned towns in India, intertwined with a canal network and backwaters in the town, lacks underground sewage network and sewage treatment facilities.

The canals of Alappuzha in the last two decades have shown visible signs of degradation owing to the indiscriminate dumping of solid and liquid waste from residential and commercial establishments. The canals are part of the huge network of water system in Alappuzha.

## CANALS

Waterways play an important part in the transportation system of Alappuzha, in certain water locked areas of the district, transportation of goods and passengers is possible only boats and ferry services. The Kochi, Alappuzha sections consisting of Vembanad lake extending from Kochi to Alappuzha along Cherthala and Ambalappuzha Taluk is the most important stretch of west coast canal system.

The important Canals in Alappuzha are Vadai canal and Commercial canal and the link canals between these two canals. Apart from these, there are many inland canals like west junction canal, East junctional canal, Uppootti canal, Murinjapuzha

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# (III)
# *Peristylus parishii* (Orchidaceae); A New Record to Kerala

Western Ghats region is considered as the repository and center of diversity of biological resources. Expeditions in the interior forests of these Ghats usually have to be resulted in the findings of new taxon. Botanical explorations in the forests of Wayanad part of south Western Ghats during 2014–2019 have yielded some interesting specimens of a ground orchid is subsequently identified as *Peristylis parishii*, a taxon hitherto unknown from Western Ghats. A detailed description of the species along with its colour photographs is provided.

**Species Description**

***Peristylus parishii*** Rchb.f., Trans. Linn. Soca. London 30: 139 (1874), *Habenaria parishii* (Rchb. f.) Hook. f. Fl. Brit. India 6(1): 161 (1890) ( King and Pantl., 1898; Rao, 1995, 2010; Lucksom, 2007; Govaerts *et al*., 2013; Verma *et al*., 2013; Chowlu *et al*., 2014).

Plant erect, ca. 60 cm tall. Tubers 2, unequal, ovoid-oblong, Stem 21- 30 cm tall, with 3-5 tubular sheaths at base, 4- 5-leaved. Leaves with size of 7 - 9 × 2.9 - 3.6 cm, ovate-elliptic, acute, clustered on the middle of the stem, undulate at margin, sheathing at base; petiole 0.5-1.5 cm long, channelled. Inflorescence 7-19 cm long, laxly many flowered; floral bracts 10 -12 × 2.5 mm, lanceolate, acuminate, green. Pedicellate ovary 5-7 mm long. Flowers green to yellow; ca. 1 cm across, dorsal sepal erect, ovate, concave, 1-veined, apex obtuse; lateral sepals spreading, 6 - 7 × 1.6 - 1.8 mm, oblong to lanceolate, oblique, 1-veined, apex obtuse; petals spreading, ovate, oblique, 1-veined, 6 - 7 × 2 mm; lip spreading to deflexed, 6 - 7 × 2.3 - 2.5 cm, ovate, ecallose, base shallowly concave, 3-lobed near middle, lateral lobes ca. 2 × 0.5 mm, shorter than midlobe, oblong, obtuse; mid lobe ca. 3.5 × 1.5 mm, triangular-oblong, sub-acute, longer than side lobes; spur pendulous, fusiform; viscidia oblong; rostellum with short arms. Pollinia 2, sectile, pyriform, with short caudiles.

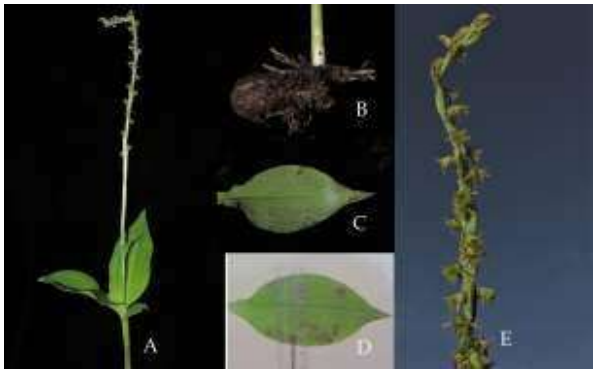


**Fig. 1:** *Peristylus parishii*. **A.** Flowering twig. **B.** Tuber. **C–D.** Leaf, **E.** Inflorescence.

**Distribution:** India [Arunachal Pradesh, Manipur, Meghalaya, Sikkim, Andaman and Nicobar Islands], China, Myanmar, Nepal, Thailand and Vietnam.

**Habitat and ecology.** Found in grassy hilltops (alt. ± 1250 m) of the Elimbilery Hills, Wayanad District, Western Ghats, Kerala, India. Grows in association with *Strobilanthes* sp., *Arisaema nilamburense* Sivad. and *Ariopsis peltata* Nimmo. A population of 10 plants was observed at the locality.

**Flowering and fruiting:** June-July

**Specimen examined :** INDIA, Kerala: Southern Western Ghats, Wayanad District, near Elimbilery water fall, 27 July 2011, *Pichan M Salim* 0415 (Deposited in the herbarium MSSRF), Fig. 1 and 2.


**Fig. 2:** *Peristylus parishii*. **A.** Young inflorescence. **B-C.** Flower. **D.** Dorsal sepal. **E.** Lateral sepals, foot and column. **F.** Petals. **G.** Flowers in inverted position. **H.** Dissected flower showing pollinia.

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# REVISITING THE TAXONOMY OF *TARENNA FLAVA* ALSTON (RUBIACEAE: IXOROIDEAE)

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## Abstract

The present paper discusses the identity and distribution of *Tarenna flava* Alston (Rubiaceae: Ixoroideae) in India. Detailed description with colour photographs are provided along with morphological comparison of the allied species *Tarenna asiatica* (L.) Kuntze ex K. Schum. Here we also designated the lectotypes for the names *Tarenna flava* and *Stylocoryna webera* A. Rich var. *montana* Thwaites.

**Keywords:** Lectotypification, south India, Sri Lanka, *Tarenna asiatica*, *T. flava*

## Introduction

The genus *Tarenna* was first described by J. Gaertner (1788: 139) on the basis of *T. zeylanica* Gaertner (1788: 139), which was known to the natives of Ceylon (= Sri Lanka) in vernacular name as 'Tarennae' (Merrill 1920). *Tarenna* is placed under the tribe Pavetteae, subfamily Ixoroideae, and in the section *Euwebera* on the basis of the number of ovules per locule (Hooker 1880). The genus consists of 192–203 species (POWO 2022, Davis *et al.* 2009) and is distributed widely in tropical Asia and Africa (De Block & Robbrecht 1998) and commonly occur from low to high elevation (Kesonbua & Chantaranothai 2008). In India, 15 taxa are recorded so far (Hooker 1880, Gamble & Fischer 1923, https://efloraindia.bsi.gov.in), and of which, 8 are present in southern Western Ghats with 6 endemics (Sasidharan & Sivarajan 1990, Sasidharan 2013). Compared to many other Rubiaceae genera, the genus *Tarenna* is very poorly known in India. In many of the herbaria, the specimens were misidentified with other genera *viz*. *Ixora* Linnaeus (1753: 110) and *Pavetta* Linnaeus (1753: 110). *Tarenna* has long been treated in a broad sense by various authors and separated the infrageneric elements of the genus mainly based on placentation and seed type (Bridson 1979, De Block *et al*. 2001).

As a part of the ongoing taxonomic revision on the genus *Tarenna* in the Western Ghats, the authors encountered an interesting specimen from the margins of shola and evergreen forests in the states of Kerala and Tamil Nadu. Critical studies perusal of the available literature (Thwaites 1859, Alston 1931, Matthew 1996, 1999, Ridsdale 1998, Murugan 2020) have revealed the identity of the collected specimen as *Tarenna flava* Alston (1931: 150), a little known species recorded from Sri Lanka and south India. Its identity has been confirmed after the comparison with its type specimens available at Kew (K) and Meise Botanic Garden Herbaria (BR). Detailed descriptions with colour photographs are provided along with morphological comparison of the allied species *T. asiatica* (Linnaeus) Kuntze ex K.Schumann (1902:332) to facilitate its easy identification.

It is also pertinent to mention that, the name *Tarenna flava* and its heterotypic synonym *Stylocoryna webera* A. Rich (1834:248) var. *montana* Thwaites (1859:158) were without precise original material, which have been lectotypified here following Art. 9.3 of the ICN (Turland *et al*. 2018).

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# Theoretical evaluation of chemical reactivity of phenol, 2-aminophenol and 2-nitrophenol by DFT

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**Abstract**

Density functional theory (DFT) was used to investigate the structural and chemical characteristics of phenol and two phenolic derivatives, ortho nitrophenol and ortho amino phenol. UV spectrum was used to investigate the effects of substituents on spectral characteristics. Mulliken charge distribution represents variation of electron density with substituents such as nitro group and amino group. In the ESP plot, the surface charge density was represented. The calculation of global descriptive parameters provides information about the compounds reactivity in terms of bandgap, softness, hardness, ionization potential, electrophilicity index etc. Since ortho nitrophenol has a high electrophilicity index, it can works as a good electrophilic species, allowing the transformation to be carried out with the aid of a strong electrophile.

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# Enhanced Adsorption Studies of Synthetic Dyes From Aqueous Solution By Polyaniline -Nickel Ferrite Composites And Its ConductivityStudies

Shine. R. Chandran[a,b], Raji. R. Krishnan [a,b]Darsana S[a,b], ElizabathJohnson,[a,b]Prema. K.H [a,b,*]

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***ABSTRACT***
*In this particular work, thecompsite of PANI with varying composition of nickel ferrite were prepared using HCl as the medium. The characterization was done using X-ray diffraction techniques and SEM analysis. These composites showed good adsorption properties towards water contaminants like malachite green and crystal violet. The electrical behavior shows increase in conductivity of pani when incorporated with ferrite, As ferrite concentration increases conductivity decreases.*

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## I. INTRODUCTION

The use of organic synthetic dyes has increased dramatically and uncontrollably in last few decades. Different types of dyes are frequently employed in plastics, paper, cosmetics, leather, and textile industries for colouring purposes. These dyes are released in water as effluents, which are of low biological oxygen demand (BOD) and high chemical oxygen demand (COD). Some of these dyes, such as azo-dyes, are toxic and carcinogenic in nature. Their addition into nearby streams and rivers contaminates water and greatly upsets the biological activities of aquatic life. It is highly desirable to explore efficient technologies for remediation and separation of these potential pollutants from effluents.

Various protocols and techniques, such as reverse osmosis, precipitation, coagulation, membrane filtration, chemical oxidation, electrochemical methods, ion exchange, and adsorption are used to remove these dyes and other hazardous materials from polluted water[1]. However, adsorption is the most frequently used technique to remove dyes from water, because this technique, in addition to easiness and low cost, causes low generation of residues and the adsorbent used may be regenerated and reused

Nanoparticles have distinct properties such as high surface area, high adsorption and special photo electric properties; and based on this, nanoparticles have applications in the removal of environmental pollutants. It is preferable to use magnetic nano particles which can be easily removed using external magnetic field. Magnetic nano materials possess adsorbent properties that qualify them as promising adsorbent materials, which open up wide field for emerging separation applications. The low potential pollutant removal ability is the main drawback of using magnetic nano particles. To invade this defect, the surface of magnetic nano particles can be modified using polymeric adsorbents such as polyaniline (PANI). The surface properties of nanoparticles can be greatly enhanced by this modification.

Due to unique characteristics, conductive polymers have been used in advanced technologies in recent years[2]. Among the various conductive polymers available polyaniline (PANI) has been widely studied not only because of its electrical resistivity, environmental stability and economic feasibility. It is highly stable in air and soluble in most of the solvents and exhibits dramatic changes in its electronic structure and physical properties in the protonated state.

In this present work , modification of nickel ferrite with PANI was used as an adsorbent for the adsorption of organic dyes such as malachite green and Crystal violet from effluent water.

## II. Experimental

### 2.1 Methodology

#### 2.1.1 SYNTHESIS OF PANI

Using APS as the oxidising agent, aniline is polymerized by chemical oxidation method keeping monomer to oxidant ratio as 1:1.25respectively. Freshly distilled aniline is dissolved in 200 ml 1M HCl. To get

# Dielectric Studies on Magneto-elastomer Composites Filled with Soft Ferrites

*Prema. K. H*

## Abstract

*Magneto-elastomer composites are flexible magnetic composites which can be synthesized by incorporating ferrites into elastomers. These composite materials are in par with their ceramic counter parts and are potential substitute for ferrites in various applications. Advantage of these materials is the processability and mouldability into desired shapes. Dielectric property of elastomers is modified with the incorporation of soft ferrites like nickel ferrite. They can be used as microwave absorbing materials. EPDM based magneto-elastomeric composites are prepared with various weight fraction of nickel ferrite. Physical properties such as dielectric and magnetic properties are evaluated. The observed data indicates that frequency dependence of the dielectric constant follows Maxwell-Wagner interfacial polarization. Dielectric and magnetic properties of these composites increase with an increase in volume fraction of the magnetic filler. Some mixture equations are applied to correlate the dielectric permittivity of matrix, filler, and composites. Dielectric constant of nickel ferrite increases with increase in temperature. Temperature dependence of dielectric constant of rubber ferrite composites shows a decrease in these values with increase in temperature. AC conductivity studies of the ceramic filler and composites are also conducted from the measured data. The results arrive at the conclusion that magnetic and dielectric properties of rubber ferrite composites can be tailored by proper loading and a judicious choice of the magnetic filler*

## Keywords

Composites, elastomer composites, ferrite, rubber ferrite composites, dielectric permittivity

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# Synthesis of Polyaniline- γ-$Fe_2O_3$ nano composites in Green Medium - Theoretical Justification of Electrical and Magnetic Properties

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**Abstract**

In this work polyaniline (PANI)-γ-$Fe_2O_3$ nano composites were synthesized via in-situ oxidative chemical polymerization technique in a green medium extracted from the fruit of plant Tamarindus indica. Various samples were prepared with 5, 10 and 15g of γ-$Fe_2O_3$ as filler in 0.4M aniline and were characterized by XRD, SEM and IR. Dielectric properties were determined in the frequency range of 100Hz to 20MHz and these values were compared with the theoretical values obtained from Maxwell-Wagner equation. Magnetic properties of the samples were analyzed by Vibrating Sample Magnetometer (VSM). A theoretical linear equation was applied to justify the saturation magnetization (Ms) values of the composites with different loading of γ-$Fe_2O_3$.

**Keywords:** Polyaniline, γ-$Fe_2O_3$, PANI-ferrite composite, Tamarindus indica

## INTRODUCTION

Polyaniline and its composites with various ferrites find great importance in the modern industry due to their extensive applications in numerous fields[1]. Materials having both electrical and magnetic properties are required for the application of electrical and magnetic shielding, molecular electronics, nonlinear optics, sensor and microwave absorbent. Low production cost and wide applicability gave it a special attention of chemists and technologists. As the property of these materials depend on the method of synthesis, filler content, solvent used, temperature applied, nature and ratio of oxidant, various studies related to the factors affecting the properties of composites are inevitable. Researchers are also intended in the studies related to the tuning of dielectric properties, AC conductivity, electromagnetic absorbance and magnetic properties of the composite with filler content.

*Research Article*

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# Conversion of aquatic weed water-hyacinth to conducting and microwave shielding material-a scientific approach

**Shine R Chandran[1,2], Anand T B[1,2], Raji R Krishnan[1,2], Deepesh D[1,2] and Prema K H[1,2]**

## Abstract

This work reports the fabrication of microwave absorbing hybrid composites of nickel ferrite (NF), poly aniline (PANI) and natural fibre extracted from water hyacinth (WHF). In-situ polymerisation method of aniline using ammonium peroxydisulphate is adopted for the synthesis of PANI, PANI-WHF and PANI-WHF-NF composites. The structural and morphological characterisations are done by XRD, FT-IR and scanning electron microscope analysis. Thermal stability of the samples is established with thermogravimetric analysis. Dc conductivity studies ensure the semiconducting nature of binary (PANI-WHF) as well as ternary (PANI-WHF-NF) composites. Microwave shielding effectiveness (SE) of the composites are studied in the frequency range of 6–8.5 GHz. Binary composites give lower SE, which further improves with the inclusion of NF to about 17 dB. The study establishes the conversion of WHF to conducting and microwave shielding material. The highlights of the work include the synthesis of PANI fibre ferrite composites through in-situ polymerization method, also addition of fibres increase the mechanical strength of the composites, the composites exhibit shielding effectiveness of 17 dB in the frequency range of 6–8.5 GHz and the composite material exhibit good conductivity in the range of $10^{-1}$ $Scm^{-1}$–$10^{-3}$ S $cm^{-1}$.

## Keywords

water hyacinth, PANI, nickel ferrite, PANI-fibre composite, PANI-ferrite composite, conducting polymer, electromagnetic shielding

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J Mater Sci: Mater Electron

# A novel approach for the fabrication of Cobalt ferrite and Nickel ferrite nanoparticles—magnetic and electrocatalytic studies

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## ABSTRACT

Creation of an economic and efficient electrocatalyst for water splitting is of prime importance to develop renewable energy technologies. The spinel oxides of first row transition metals are widely employed for the application of OER due to their excellent stability in neutral and alkaline medium. This study reveals the magnetic properties and electrocatalytic OER activity of spinel ferrites, cobalt ferrite and nickel ferrite nanoparticles synthesised by a novel method (Patent No: 360528). Lime fruit extract was used as the medium for the sol–gel auto combustion synthesis of ferrite nanoparticles. X-ray diffraction studies revealed the crystallization of ferrites in cubic spinel structure. The Fourier transform infrared spectral study gives characteristic vibration bands of ferrites. XPS spectrum confirms the presence and oxidation states of elements in the samples. Vibrating Sample Magnetometer measurements illustrate the ferromagnetic nature of the sample. Saturation magnetization, magnetic remanence and the coercivity determined from the hysteresis loop are found to be in good agreement with the reported values. Under basic conditions, the electrode modified with nanoparticles exhibited an enhanced electrocatalytic OER activity. The overpotential corresponding to 10 mA $cm^{-1}$ was found to be 410 and 530 mV versus RHE for CFL and NFL, respectively. Besides, the electrode possesses excellent stability for several OER cycles without loss of activity.

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J Mater Sci: Mater Electron

# A novel approach for the fabrication of Cobalt ferrite and Nickel ferrite nanoparticles—magnetic and electrocatalytic studies

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## ABSTRACT

Creation of an economic and efficient electrocatalyst for water splitting is of prime importance to develop renewable energy technologies. The spinel oxides of first row transition metals are widely employed for the application of OER due to their excellent stability in neutral and alkaline medium. This study reveals the magnetic properties and electrocatalytic OER activity of spinel ferrites, cobalt ferrite and nickel ferrite nanoparticles synthesised by a novel method (Patent No: 360528). Lime fruit extract was used as the medium for the sol–gel auto combustion synthesis of ferrite nanoparticles. X-ray diffraction studies revealed the crystallization of ferrites in cubic spinel structure. The Fourier transform infrared spectral study gives characteristic vibration bands of ferrites. XPS spectrum confirms the presence and oxidation states of elements in the samples. Vibrating Sample Magnetometer measurements illustrate the ferromagnetic nature of the sample. Saturation magnetization, magnetic remanence and the coercivity determined from the hysteresis loop are found to be in good agreement with the reported values. Under basic conditions, the electrode modified with nanoparticles exhibited an enhanced electrocatalytic OER activity. The overpotential corresponding to 10 mA $cm^{-1}$ was found to be 410 and 530 mV versus RHE for CFL and NFL, respectively. Besides, the electrode possesses excellent stability for several OER cycles without loss of activity.

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# Synthesis of AgNPs using *Sapindus mukorossi* Fruit Extract: Characterization and Antimicrobial Property

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**Abstract**

Silver nanoparticles (AgNPs) have been synthesized using fruit extract of *Sapindus mukorossi* from silver nitrate solution. Phytochemicals present in the extract act as both capping and reducing agent. The formation of AgNPs was studied using UV-Vis spectrophotometer and AgNPs formed were characterized by X-ray diffraction (XRD), Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM). TEM micrographsshowed spherical particles with an average size of 22 nm. The XRD pattern showed the characteristic peaks of (111), (200) and (220) facets of the face center cubic (fcc) silver nanoparticles and confirmed that these nanoparticles are crystalline in nature. SAED pattern also confirms the fcc AgNPs. Synthesized AgNPs showed potential antibacterial activity towards the bacterial strains SMB3, WHB3 and WHB4.

***Keywords***: *Silver Nanoparticles, Phytochemical, Capping Agent, Sapindus Mukorossi, and Antimicrobial Property.*

# Particle Assisted Breath Figure Pattern on Polystyrene Alumina Nanocomposite Film: Effect of Particle Size

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**Abstract**

Breath figure (BF) cavities having a diameter of ~3 μm were prepared on polystyrene alumina hybrid films with the aid of amphiphilic modified alumina particles with an average size of 20nm by casting the hybrid solution on a suitable substrate and the solvent was evaporated off under ambient humidity condition. The effect of particle size as well as the hydrophobic to hydrophilic ratio of the modifier on the alumina particle surface for deciding the breath figure morphology was investigated by comparing with our previous publication. It is interesting to note that large BF cavities with random distribution were obtained when the particle size is decreased to 20nm. This inference has been explained by a plausible mechanism based on the particle-assisted stabilization of breath figures formed on the polystyrene film surface during the solvent evaporation of the casted hybrid solution.

***Keywords***: *Breath Figure, Micropatterning, Polystyrene, Nanocomposite, and Alumina.*

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Short communication

# Photocatalytic activity of biogenic silver nanoparticles synthesized using *Coleus Vettiveroids*

Sreelakshmi Ajay, Jayanthy S. Panicker, K.A. Manjumol, Parameswaran P. Subramanian *

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ABSTRACT

In this work, simple, safe and eco-friendly synthesis of silver nanoparticles (AgNPs) using the leaf extract of *Coleus Vettiveroids* was carried out and it showed that the chemical species variations in this common family of plant extracts can have a different reducing ability of silver ions. The nanoparticles of silver were formed by the reduction, during UV exposure, of aqueous silver nitrate solution containing leaf extract of *Coleus Vettiveroids*. The AgNP formation was confirmed by the appearance of Surface Plasmon Resonance (SPR) band at ~420 nm, which is characteristic for nano silver. The size of the prepared nanoparticles was characterised using Dynamic Light Scattering (DLS), average particle size was around 41.4 nm and for Transmission Electron Microscopy (TEM) the size was found to be ~30 nm. The biogenic AgNPs found to have photocatalytic ability to degrade textile dyes such as crystal violet, methylene blue and malachite green. They exhibited excellent catalytic activity in the degradation of organic dyes within 3 hours of exposure time in presence of sunlight.

## 1. Introduction

Biogenic synthesis of metallic nanoparticles is one of the emerging topics in the domain of Nanoscience and Nanotechnology. Compared to other synthetic routes for nanoparticles, green synthesis finds immense importance by avoiding the toxic materials [1–3]. Biological entities such as plant materials and microorganisms have been used for the biogenic nanoparticle synthesis. Use of plant based materials for synthesis of nanoparticles is found to be a more adaptable technique than microorganisms based synthesis as the latter technique requires extra care and specific conditions for culture medium [4,5]. Flavones, organic acids, and quinones are the main water soluble phytochemicals accounts for the capping and reduction process involved in nanomaterial synthesis [6]. Biocompatibility and high stability in water are the main advantages of plant derived nanoparticles. In 2003, Torresdey *et al.* reported the silver nanoparticles from the plant extract of *Alfalfa* sprouts for the first time [7].

Nanoparticles of noble metals such as gold and silver are found to be versatile materials as they act as catalyst, sensor, drug delivery carrier etc [8–10]. Excellent optical properties of noble metals arise due to the peculiar property called Surface Plasmon Resonance (SPR). When light falls on a particle having smaller size than wavelength of light, there is a frequency match of conducting electrons near the particle surface and incident light oscillations which leads to the resonant light absorption and scattering [11]. This phenomenon is called SPR. Among the metal nanoparticles, silver nanoparticles (AgNPs) show wide applications ranging from biomedical field to photovoltaics. Green synthesis of AgNPs from plants like *Daucuscarota, Solanumlycopersicums*, *Hibiscus cannabinus* leaf, *Moringaoliefera* flower, *MurrayaKoenigii* leaf, mushroom, coconut oil, *Macrotylomauniflorum*, *Ananascomosus* etc. have been reported [12,13].

Recently, extensive studies on photocatalytic activity of AgNPs were reported [14–16]. Synthetic organic dyes such as methylene blue, methyl red, congo red, saffranine, eosin Y, bromophenol blue, malachite green, phenol red etc were used in the dyeing purpose of plastic, paper, pharmaceutical, cosmetic, food, and textile fibres [17]. Several studies have investigated the catalytic activity of nanoparticles against a variety of toxic dyes, including Auramine O, Thymol blue, Rhodamine B dye, Congo red, Phloxine B, Methyl orange [18–21]. Most of the textile dyes are water soluble and these dyes are highly carcinogenic and toxic which creates pollution to water bodies and environment. According to statistical reports from several studies, up to 15 % of dyes applied to textile fibre drip and release into wastewater. Textile dyeing procedure consumes a significant amount of water, as a consequence, a large volume of inappropriate discharge is rejected [22,23]. These compounds cause negative impact when discharged in untreated manner. Untreated dye

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## CONTENTS

# DO THE PRIVATE LEAD INSURANCE COMPANIES CAPITALIZE THE BENEFIT OF COVID 19?

*Dr Priya r ,Assistant Professor, Sanatana Dharma College, Alappuzha*

**Abstract:**
Medical Insurance products do play a large role in the personal finance structures of middle class Indian citizen. The increasing cost of living along with the cost of hospitalization expenses is becoming a night mare for the youth .The personal saving of the people will be definitely including with medical insurance to cover the medical expenses.
Insurance as a primary ingredient in a holistic and well-rounded financial portfolio in personnel finance is going to be the most immediate demand of a post-Covid developing world. It has been almost three months since one of the biggest economies in the world have undergone a complete lockdown due to the deadly Coronavirus. While most developing and developed countries, India included, are setting a brilliant example of containing the spread of the pandemic – one thing that the abrupt arrival of this pandemic has taught people the growing need of having an insurance policy as a fixed part of their financial planning. This paper makes theoretical analysis of private insurance companies coming up with products to meet such demand.
Key words: *Private insurance companies, Medical Insurance, financial planning.*

## Introduction

India's health insurance market got the edge with the introduction of workmen's Compensation Act 1923, backed with ESI Act 1948.Since then the health insurance sector is growing to capture the need of corporates and individuals, village to urban, infant to senior citizens and thus to enter in niche markets. Healthcare industry in India is growing with large density .The industry covers hospitals, medical devices, clinical trials, outsourcing, telemedicine, medical tourism, health insurance and medical equipment. The introduction of Insurance Regulatory Authority Bill 1999 opened the beginning of new era in health care industry by attracting international players in the sector. The industry attracts both public and private players and is growing at a tremendous pace owing to its strengthening coverage, services and increasing expenditure. Such a great leap obliges to our constitution which ensures right to health to all.
In India majority of the expenses are out of pocket cost as the percentage of budget allotted to health sector is 1.15% and the allocation is given for the research and development activities (Budget 2020).That indicates that individuals have to bear their cost of hospitalisations and other related expenses by themselves.The risk of personnel financial distress in the situation of treatment is crucial for all people especially salaried employees whose income is fixed. To capitalise the situation of such fright many insurance companies including public and private insurance companies are coming up with various medical insurance plans so as to support the personnel financial planning.
The pandemic Covid 19 has ambitious ultimatum for health insurance, which was otherwise under-penetrated insurance market. With the increasing number of cases in India, people have understood the importance of owning a health insurance product.
The regulator is also encouraging insurers to launch short-term COVID-19 products which are seeing huge demand from consumers.

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# EXPONENTIAL APPROACH OF LIFE INSURANCE SECTOR IN INDIA

*Dr. Priya R

**Abstract**

Health insurance has taken in the significant role in the front role as it comes to investment, protection, and on return based investment. The health insurance role has secured the quality healthcare as investing in health finance. The pandemic has driven a sudden realization around the significance of protective investments, especially when it comes to the aspects of health and life security. Insurance primarily deals with protection. Medical Insurance products do play a large role in the personal finance structures of middle class Indian citizen. While most developing and developed countries, including India, are setting a brilliant example of containing the spread of the pandemic - one thing that the abrupt arrival of this pandemic has taught people the growing need of having an insurance policy as a fixed part of their financial planning. At the same the present situation has demanded the innovations in insurance sector. The Covid 19 catalyst has been unlocking the higher stages of customer satisfaction and personalisation in the insurance products. The uses of digital tools including mobile apps have helped the insurance companies to engage with customers more effectively. Digitalisation in health insurance affords insurer and insured a lot of benefits. The article focuses to bring in knowledge about novel initiation in health insurance sector with product and process.

**Key words:-** Digitalisation, Financial Planning, Health Insurance, Medical Insurance, Private Insurance Companies.

India's health insurance market got the edge with the introduction of workmen's Compensation Act 1923, backed with ESI Act 1948.Since then the health insurance sector is growing to capture the need of corporates and individuals, village to urban, infant to senior citizens and thus to enter in niche markets. Healthcare industry in India is growing tremendously. Hospitals, medical devices, clinical trials, outsourcing, telemedicine, medical tourism, health insurance and medical equipment is covered here. The introduction of Insurance Regulatory Authority Bill 1999 opened the beginning of new era in health care industry by attracting international players in the sector.

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# FINANCIAL MANAGEMENT PRACTICES OF SMALL AND MEDIUM ENTERPRISES

***Dr. Krishnan M**

**Abstract**

Micro, Small and Medium Enterprises are the real engine for growth of an economy. In India, the contribution of MSME is significant. Proper financial management is considered to be a pre requisite to the success of an organization. However, the effect of financial management practices of MSMEs on their profitability is less researched and therefore, in the context of the state of Kerala, this impact is assessed in this current study. Financial management practices are grouped into financing, investment, inventory management, cash and receivables management practices. The impact of these practices on profitability of the organization is measured using statistical tools and conclusions arrived at. All the financial management practices grouped for the present study are found to be having significant positive relationship on the profitability.

**Key words:-** Finance, MSME, Financing, Investment, Working capital.

Micro, Small and Medium Enterprises (MSMEs) are considered to be the backbone of the growth of any nation and India is no exception to it. In the global context, MSMEs do contribute a larger share to the growth of developed as well as developing economies. MSMEs have proved to be the major employment generator of Indian economy as they rely heavily on manual labour than mechanized way of operations. The limited resources in terms of capital to the MSMEs make them employ more man power and this in turn leads to spreading of wealth. MSMSE sector has created around 11.10 crore jobs (360.41 lakh in Manufacturing, 387.18 lakh in

**Dr. Krishnan M, Assistant Professor of Commerce, P G & Research Department of Commerce, Sanatana Dharma College, Alappuzha.*

# IMPACT OF MARKET ORIENTATION ON THE PERFORMANCE OF SMALL AND MEDIUM ENTERPRISES

***Dr. Krishnan M**

**Abstract**

Small and Medium Enterprises are drivers of growth of any economy by creating more jobs and spreading of wealth among all sections of the society. The small-scale sector leads to employment generation, spreading of wealth and increased purchasing power among the general public. The small-scale sector also is a major contributor of exports of a nation thereby helping the trade deficit of any nation. Market orientation is a business policy which expects the business to implement the marketing concept. The present study looks at whether the market orientation of the firm has an impact on the profitability of the firms.

**Key words:-** Market Orientation, Small and Medium Enterprises, Profitability

Countries across globe are very concerned about their policies revolving small and medium enterprises. SMEs have great power for creating jobs and spreading wealth among all the sections of the society. However the problem within the MSME sector is the diverse nature of the units. Policies are easy to be framed when there is homogeneity among the units. Small scale sector with lesser availability of funds primarily focus on manual labour for their operations. This leads to employment generation, spreading of wealth and increased purchasing power among the general public. The small-scale sector also

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# THE QUESTION OF COUNTERCULTURE IN THE CARTOONS OF KERALAM

**Basil Thomas** Assistant Professor in English, Christian College, Chengannur.
**Dr. E. Krishnan Namboothiri** Research Supervisor and Associate Professor in English, S. D. College, Alappuzha

## ABSTRACT

Cartoonist Toms' mischievous characters Boban and Molly are two domestic names in the households of Keralam for over 50 years, chiefly through the pages of the *Malayala Manorama Weekly*. He introduced the character Appy Hippie for the first time in "Bobanum Mollyum" in the *Malayala Manorama Weekly* in 1971. Appy Hippie is a village hippie portrayed as a jobless youth who is quite obsessed with the 'company of women'. Hippies distinguish themselves in their appearance from social etiquettes of attire and grooming. Consequently, a binary opposition is created between the hippie and the mainstream society. Toms portrays Appy Hippie by keeping the norms of moralism intact and projects him as a laughing stock. This portrayal is problematic because as a hippie, he is reduced to a womanizer, pickpocket and kidnapper. This paper attempts to claim that in the trajectory of Toms' cartoons, Appy Hippie is the scapegoat of mainstream bigotry and usually considered as a person with no more significance than as a comic character. As such, it attempts to see the character from the perspective of a liberal minded one-man army standing against the norms of an orthodox society.

**Keywords:** bigotry, *Bobanum Mollyum*, body shaming, counterculture, dominant culture, hippie, moralist.

## The Question of Counterculture in the Cartoons of Keralam

Cartoonist Toms' mischievous characters Boban and Molly are two domestic names in the households of Keralam for over 50 years, chiefly through the pages of the *Malayala Manorama Weekly*. The cartoon characters were named eponymously after two children in his neighbourhood, Boban and Molly, who asked him one day to draw their picture. When he left *Malayala Manorama*, Toms commenced publishing *Bobanum Mollyum* in *Kalakaumudi*, to which *Malayala Manorama* objected legally. After a controversial legal battle between Malayala Manorama and Toms, *Bobanum Mollyum* began to appear as a comic magazine called *Tom's Magazine*.

The character, Appy Hippie, appeared for the first time in "Bobanum Mollyum" in the *Malayala Manorama Weekly* in 1971. Appy, a hippie, is introduced as the son of a village verger ('Kapyar' in Malayalam) named Thomachettan of Marappil Family. On returning to his native

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# THE CHANGING FACES OF EDUCATION IN KERALAM: THROUGH THE LENS OF THE CARTOONS OF KERALAM

**Basil Thomas,** Assistant Professor in English, Christian College, Chengannur.
**Dr. E. Krishnan Namboothiri,** Research Supervisor, HoD and Associate Professor in English, S. D. College, Alappuzha

**Abstract**
The large number of comic magazines that existed in Keralam even before the official formation of the state in 1956 reinstates the affinity of the Malayalam speaking people towards cartoons. The social situations and the functioning of various institutions like education and employment were a source of inspiration for the cartoonists from Keralam. The high literacy rate of Keralam is not the product of a single day. The foundation work of this had started even before the formation of the state. This paper tries to analyse the education system of Keralam portrayed in the cartoons of cartoonists Toms, Aravindan and Thomas. The cartoons of Toms, Aravindan and Thomas portray the day to day life of Keralam in their social cartoons, including the school life and college life of the period of the second half of the twentieth century. There are two phases in the development of the education sector in Keralam: the first phase focusing mass education where the major capital investor was the state itself and private investment was not encouraged. The second phase witnessed a fast paced growth and urbanization after the 1970s because of the large scale migrant remittance. The changing faces of the education system of Keralam can be seen in the cartoons of these select cartoonists.

**Key words**: *affordability, cartoon, college, education, school, social scenario*

The rich heritage of cartoons in the history of Keralam springs from the first Malayalam cartoon titled 'Mahakshamadevatha' that appeared in the year 1918 in the magazine *Vidooshakan*. The surplus number of comic magazines that existed in the state even before its official formation in 1956 reinstates the affinity of the Malayalam speaking people towards this art form. Scored a century and still playing in the attacking mode, the cartoonists of Keralam stand high among the reputed world cartoonists. The Indian cartoon and caricature industry flourished with the advent of Sankar, the tycoon of Malayalam cartoons from Keralam. Through decades, Keralam flourished in the field of cartoons with the cartoonists like O. V. Vijayan, Abu Abraham, Ravi Shankar, Toms, Yesudasan, Aravindan, Thomas, Nathan, Gopikrishnan, P. K. Manthri, Malayatoor Ramakrishnan, E. P. Unni, V. H. Unnikrishnan et. al. Keralam hatched and delivered so many cartoonists nationally and internationally. From the readers' end, this popularity for the genre can be explained from the view that the intellectual majority welcomed this art and made it a part of their reading habit, both seriously and for fun. Yet, the more logical reason for how the cartoonists of Keralam were appreciated because they found the raw material for their work in the daily social scenario of the state.

While other regional cartoons were in the infant stage, the cartoons and cartoonists from Keralam proved to be more mature and professional. When the cartoonists from other states looked forward to the national scenario for their inspiration, the social situations and the functioning of various institutions like education and employment became the resources for the cartoonists from Malayalam. The high literacy rate of Keralam is not the product of a single day. The foundation work of this started years before the official formation of the state. Regarding the educational influence of the state, Robert L. Hardgrave, Jr. made a significant comment that "Kerala is a land of contradictions in a nation of contrasts. It has the highest literacy rate and the highest rate of unemployment" (Hardgrave 120). The cartoons published in 1940s, 1950s and 1960s quite sharply portray a clear picture of the education system that prevailed in Keralam. 'Teaching and learning' are portrayed in the cartoons of early Malayalam magazines like *Vidhooshakan*, *Narmada*, *Vikadakesari*, *Viswaroopam*, *Thaniniram*, *Sarasan* and others. This paper tries to analyse the education system portrayed in the cartoons of select cartoonists Toms, Aravindan and Thomas.

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Date : 13/01/2022



To

Ms. Karthika R.
Assistant Professor
Department of English
Sanatana Dharma College, Alappuzha

&

Dr. Anjana J.
Assistant Professor
Department of English
N. S. S. College
Pandalam

Dear Ms. Karthika R. & Dr. Anjana,

I am happy to inform you that your article "**Dialectics of Power Transformation: A Foucauldian Reading of Vaisakhan's Railway Stories**" has been accepted for publication in *Journal of Literature & Aesthetics* Vol. 22, No.1 (Jan.-June 2022).

Yours Sincerely

S. Sreenivasan
(Chief Editor)

Dr. S. SREENIVASAN
Chief Editor
Journal of Literature & Aesthetics
Pattathanam, Kollam
Kerala - 691 021

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# 'As the reader witnesses the character's learning, they are learning as well': talking comics, graphic medicine, and menopause with M.K. Czerwiec

Chinmay Murali

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INTERVIEW

# 'As the reader witnesses the character's learning, they are learning as well': talking comics, graphic medicine, and menopause with M.K. Czerwiec

Chinmay Murali

Department of English, Sanatana Dharma College, Alappuzha, India

**ABSTRACT**

M.K. Czerwiec, a.k.a. comic nurse, is one of the founding members of the graphic medicine movement which meshes the concerns of comics and healthcare. Czerwiec combines her experience as a healthcare practitioner and her fascination for the visual aesthetics of comics in exploring the representations of health and illness in graphic medicine. In this interview, Czerwiec elaborates on the significance of her Eisner award-winning comics anthology, *Menopause: A Comic Treatment* (2020), in foregrounding the complexities of women's lived experience of menopause and its attendant physical/psychic challenges. Czerwiec's observations illustrate the cultural power of graphic medicine to offer visibility and intelligibility to women's lived perspectives on menopause. Additionally, the conversation addresses Czerwiec's creative involvement with the field of graphic medicine, her perspectives on comic art and creativity, and graphic medicine's future as an interdisciplinary enterprise.

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Graphic medicine; menopause; comics; women's health; reproduction; gynographics

**There is a conspicuous absence of representations of menopause in mainstream cultural discourses. Put differently, it's often a tabooed term in common parlance. In this context, what's your motivation behind creating a comics anthology on menopause?**

First, I'd like to say that we are in a moment of change in that regard. More and more books and conversations are emerging that address menopause. According to journalist Ann Marie McQueen, 'there is a major shift and a tipping point on the way, with 1.1 billion women going through menopause globally by 2025' (McQueen 2021). I curated *Menopause: A Comic Treatment* in order to dispel stigma around the topic, to learn from others who have experienced this time of life, and to share comics about menopause in which we are the ones defining the discourse rather than being defined by it.

**Your anthology is polyphonic, featuring comics created by established and emerging comics artists, academics, and artists belonging to marginalised gender identities and racial groups. Comics echoing these diverse voices accentuate the fact that the experience of menopause is not singular. Is this diversity of voices deliberate? How did you select comics for this anthology?**

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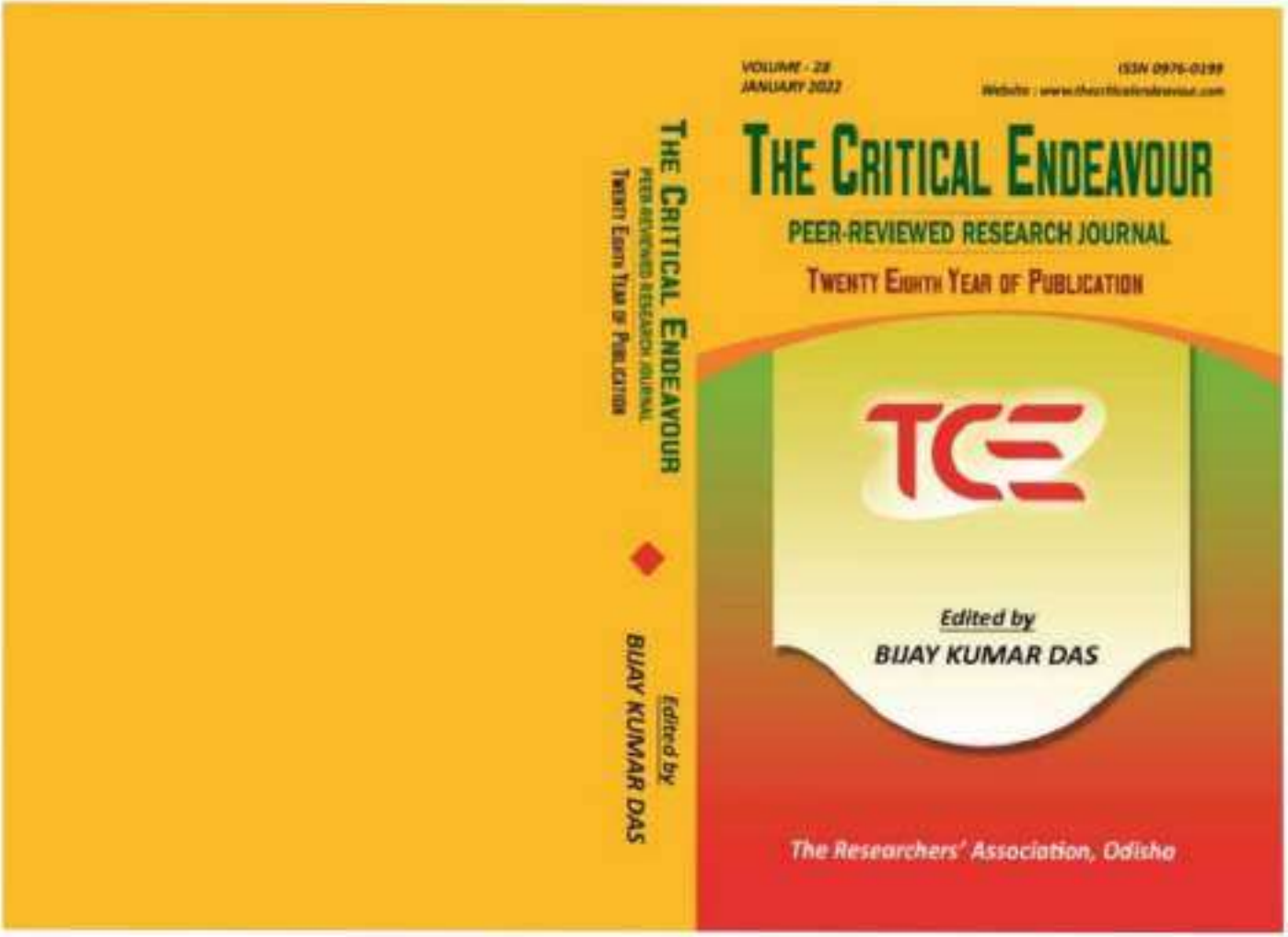
Supplemental data for this article can be accessed here.






# *Dedicated*

*to the Memory of my revered teachers who passed away during the Covid-19 Pandemic Period :*

**Professor Mahajiteswar Das**

**Professor Jitendra Narayan Patnaik**

**Professor Syed Akhtar Husain**

*BIJAY KUMAR DAS*
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**RESEARCH NOTE**



**BOOK REVIEW**







❑ ❑ ❑

**"Viewing the female subaltern body: Cultural discourse and sexual violence in "Behind the Bodice: Choli ke peeche""**

By Dr. Bindu Nair, Associate Professor of English, S.D. College, Sanathanapuram P.O., Alappuzha-688003. Mob: 9847268208 email: binduani18802@gmail.com

**Abstract**

The celebrated Bengali writer and activist Mahasweta Devi's literary works articulate the concerns of gender with a precise sensitivity to the socio-historic specificities of the women of tribal and other subaltern groups she represents in her fiction. The three short stories in the collection *Breast Stories* (1997) represent the sexual violence and exploitation of tribal women in contemporary India. In them, the female breast becomes the site upon which acts of oppression, exploitation, lust and violence are carried out. This paper focuses on the short story "Behind the Bodice : Choli ke peeche", looking at how the discursive practices of "viewing" female subaltern bodies in mainstream cultural discourses, especially popular Bollywood "Item numbers", leads to their devastating exploitation in contemporary India.

**Keywords**: Subaltern women, "viewing" the female body, colonial, patriarchal and sexist cultural discourses, "item numbers".

The celebrated Bengali writer and activist Mahasweta Devi's literary works articulate the concerns of gender with a precise sensitivity to the socio-historic specificities of the women she represents in her fiction. Mahasweta has often shied away from the label of "feminist", but she does not make light of the issue of gendered oppression. In an interview she said, "Women have to pay a lot... I will not say feminist but whenever I see women, I want to bring out what they do." (Interview *An Anthology* 224-5) Even while respecting the writer's resistance to labeling, one cannot but respond to the overtly gender-sensitive delineation of the lives of marginalized people in India in her writing. Her portrayals of women -as mothers, wives, daughters, working women, bonded labourers, witches, prostitutes, revolutionaries and rebels – have encompassed different historical periods and diverse social milieu. The Santhal woman who is a Naxal revolutionary in "Draupadi", Jashoda, the poor Brahman woman in "Stanadayini", the low- caste woman who becomes a professional mourner in "Rudali", the middle-class mother of *Mother of 1084*, - they have all embodied Mahasweta's deep and abiding concern with representing the gender-inequality, sexual exploitation and violence faced by women from a cross-section of Indian society, especially from the subaltern groups, who are doubly marginalized, both within their own community as well as in their interface with the mainstream groups in India.

It is a generally–held belief that the women in tribal societies enjoy more freedom, better social status and are more empowered than their counterparts in non-tribal societies in India. This is a view that owes its origin to the sociological/anthropological writings of the colonial era, based on studies of older tribal societies that were large and fairly autonomous, and they compared and contrasted the tribal women's status with that of non-tribal women of India. With the

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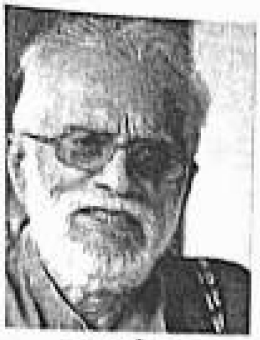
# Socio-cultural Marginalization and Tribal Resistance: A Reading of *Bitter Soil* and "Pterodactyl, Puran Sahay and Pirtha"

Dr.Bindu Nair
Associate Professor of English, Department of English
Sanatana Dharma College, Alappuzha, Kerala

**Abstract**
A discussion of the socio-political and historic constructions of the subaltern classes in India involves the particular intersections of the categories of class, caste, tribe and gender within its framework. A long history of domination and oppression from pre-colonial times to the present day has transformed most of India's tribes to poverty-ridden, exploited and dispossessed groups of people, robbed of the material and cultural basis of their lives. Mahasweta Devi, the iconic Bengali writer articulated the particular intersections of the issues of tribe with the larger picture of class-exploitation in colonial and postcolonial India in her powerful, trenchant fiction, activism and her journalistic writings. From *The Book of the Hunter* to "Pterodactyl, Puran Sahay and Pirtha", Mahasweta Devi's texts chart the history of the downward spiral of the tribal's dispossession and their struggle to uphold their identity, from pre-colonial times to the present day. In a series of short stories, titled *Bitter Soil* (2002), Mahasweta Devi articulates the painful truth of the lives of rural India's poor and marginalized people, mostly tribals, in modern India from the 1970s to the 1990s, centered in the region of Palamau. Each of the four stories in this collection, "Little Ones", "Seeds", "The Witch" and "Salt", dramatizes a particular region, its tribal inhabitants and a specific issue that brings to the fore the magnitude of their suffering and the mobilization of their resistance. The long story "Pterodactyl, Puran Sahay and Pirtha", portrays the unbridgable gap between the intentions and claims of the state viv-a-vis the welfare of the tribal population, in all its complexities. Through the innovative use of the oral tribal traditions of song, tale and myths in the thematic and aesthetic elements of her fictional narratives, Devi achieves the foregrounding of tribal identity and resistance. Her narratives not only re-write the tribals' past and contemporary history, but also uphold the relevance of the subaltern's resistance against the dominant authoritative and discursive structures of the nation that seek to erase their distinct tribal identity through the powerful shackles of class oppression.

**Key Words:** Subaltern, class, tribe, marginalization, discourse, tribal identity, subversion, oral traditions, tribal resistance

The subaltern classes in India are constituted by varied groups of people marked by differences of race or tribe, caste, region and gender. A discussion of the socio-political and historic constructions of the subaltern classes in India therefore involves the particular intersections of these categories within its framework. A long history of domination and oppression from pre-colonial times to the present day has transformed most of India's tribes to poverty-ridden, exploited and dispossessed groups of people, robbed of the material and cultural basis of their lives. Ruthless exploitation at the hands of the colonial administrators, landlords and traders, forced the tribals to leave their traditional lands and migrate to other places as peasants and labourers. Though this resulted in many tribal revolts and peasant rebellions in the nineteenth century, they were mercilessly suppressed by the colonial army. The discursive constructions of race and caste helped further this process. The tribes were pictured as being naturally "suitable" to hard labour because of their wild and hardy nature, their "castelessness" and so on. (Ania Loomba 126; Kaushik Ghosh 13-14; Chaudhari) The proud, independent adivasis of India were thus reduced to near



ज्ञानरंजन

# ज्ञानरंजन की कहानियों में आधुनिकता और परंपरा का अन्तर्विरोध

*('पिता', 'फ़ेंस के इधर-उधर' और 'अमरूद के पेड़' के विशेष संदर्भ में)*

डॉ.पूर्णिमा.आर.

१९६० से लेकर १९७५ तक का डेढ़ दशक नई कहानी का दूसरा दौर माना जाता है। भारतीय जीवन व्यवस्था में यह तेज़ बदलाव कां दौर था। कृषि-आधारित अर्थव्यवस्था औद्योगीकरण की ओर उन्मुख हुई। अर्थव्यवस्था के बदलने से सामाजिक जीवन का नक्शा बदला। लोगों की मानसिकता, रहन-सहन, जीवन-मूल्य सब बदले। पश्चिमी और पूँजीवादी संस्कृति का विकास तेज़ी से होने लगा। किसान मज़दूर बने, युवापीढ़ी नौकरी की तलाश में देश से विस्थापित हुई, संयुक्त-परिवार विघटित होकर एकल परिवार में बदला, संचार-माध्यमों का वर्चस्व स्थापित हुआ साथ ही साथ विज्ञापन की संस्कृति का उदय हुआ।

संक्रमण के इस साठोत्तरी दशक में साहित्यक जगत् में ज्ञानरंजन का पदार्पण हुआ। उनकी कहानियाँ घटनाबद्ध नहीं, नवीन भावबोध और मूल्यदृष्टि को प्रस्तुत करनेवाली हैं। युग जीवन की विसंगतियों को पहचानने की अद्‌भुत क्षमता ज्ञानरंजन की कहानियों में दृष्टिगत है। अनुभूति और अभिव्यक्ति के समतोल से उनकी कहानियाँ काव्यात्मक बन जाती हैं।

सन् १९६० में छपी 'मनहूस बंगला' उनकी पहली कहानी है। ज्ञानरंजन के छह कहानी-संग्रह प्रकाशित हुए हैं। पहला कहानी-संग्रह १९६८ में प्रकाशित 'फेंस के इधर उधर' है। सन् १९७१ में प्रकाशित 'यात्रा' और सन् १९७७ में निकले 'सपना नहीं' और 'क्षणजीवि' उनके अन्य प्रसिद्ध कहानी-संग्रह हैं। युगमानव के जीवन- मूल्यों में जो क्षरण हुआ है, आपसी संबन्धों में जो बदलाव आये हैं, आधुनिक और पुरानी पीढ़ी के बीच में जो गहरी खाई उत्पन्न हुई है इन सबकी ईमानदार प्रस्तुति उनकी रचनाओं में है।

पारिवारिक कथाफलक को लेकर ज्ञानरंजन की कहानियाँ चलती हैं। पहली कहानी 'मनहूँस बंगला' में अनुशासनप्रिय एवं सामंती सोच का शिकार पुरानी पीढ़ी और नये सोचवाली युवापीढ़ी के बीच का द्वन्द्व चित्रित है। पुराने मूल्यों का वाहक पुरानी पीढ़ी है, नई नहीं। परिवार में पीढ़ियों की खाई गहरी होती जा रही है। बदली हुई सोच और टूटी हुई आस्थाएँ पारिवारिक धरातल पर बड़ी चिन्ता का कारण बनी हैं। विसंगतियों और विडंबनाओं के बीच में मनुष्यता की तलाश करने की कोशिश में लगा हुआ है लेखक।

ज्ञानरंजन की रचनात्मक ईमानदारी का जीवन्त साक्ष्य है 'पिता' कहानी। यह उनकी बहुचर्चित, बहुपठित कहानी है। कहानी के शुरु में लगता है कि यह

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# A BRIEF HISTORICAL INTROSPECTION ON THE EVOLUTION OF THE TRAVANCORE POLICE FORCE

**Dr. Vishnu Sreevalsan**
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## ABSTRACT

An efficient Police force is a pre-requisite for maintenance of peace in every society. A modern police force fulfills two main functions namely the maintenance of law and order in the society and investigation of cases. A legal system cannot work properly without an efficient system of policing. Therefore, any study into the evolution of society will be incomplete without studying the evolution of its police apparatus. This paper studies the evolution of the Travancore Police force and its relationship with the judicial system that existed in the state.

**KEYWORDS:** Travancore, Police Force, Police Reforms, Travancore History, Legal History

## INTRODUCTION

Till the 19th century, Travancore followed traditional methods for the maintenance of law and order. Certain government officials and local chiefs fulfilled the roles of both police and lower judiciary. However, an increase in criminal cases and the increasing influence of the British in the affairs of the state necessitated the formation of a separate police department. Initial steps in this regard were taken during the time of Diwan Ummini Thampi (1809-1810). Ummini Thampi organised a small police force comprising of two hundred men in 1809[i]. Their main duty was to prevent robbery and other violent crimes[ii] and they were called Kavalkars or Kaval.

The first major reforms of Travancore Police came in 1811 under the stewardship of the Diwan-Resident Col. Munro. Munro reorganised the police force and more than doubled its strength to five hundred[iii]. The duties and powers of the police force were extended. They now dealt with crimes like armed robbery, theft, murder, illegal entry and smuggling. The police were authorised to arrest those suspected of crimes and the suspects were to be duly produced before a Darogha[iv] attached to the local subordinate court. It was the duty of the Darogha to report the names of suspects and charges made against them to the local court. If the case had witnesses the court checked their authenticity and if satisfied, it fixed a day for the trial of the suspects. In cases without witnesses, it was the duty of the police officers to produce the suspect directly before the court[v].

In 1817, a pilot scheme was launched in the Sencottah taluk whereby the Tahsildars were given police and magisterial powers to deal with petty cases[vi]. This scheme proved to be a great success and as a result, the government of Travancore extended this to all other taluks in the state. The legislation giving Tahsildars police and magisterial powers was enacted in 1834[vii]. In 1847, the government further augmented the powers of the Tahsildars further by giving them police powers over the entire revenue district. Nonetheless, this measure proved counterproductive as the Tahsildars, owning to lack of knowledge of areas under their control, could not discharge their police duties properly[viii]. In 1854, there was major restructuring of the revenue department in the state with the establishment of revenue divisions. The Diwan Peshkars were tasked with supervising the Tahsildars on matters of revenue, judicial and police matters by order of the Diwan[ix]. However, the reorganisation of the revenue

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Authored By

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# Light emitting, segmented block copolymers containing distyrylbenzene blocks connected through α,ω-nonamethylenedioxy chain spacer for applications in polymer light emitting diodes

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ARTICLE INFO

*Keywords:*
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ABSTRACT

Two novel, soluble, semiconducting and light emitting segmented block copolymers, termed as NPPV1 and NPPV2 are synthesized using Horner-Emmons condensation polymerization. The chromophoric groups present in the copolymers are distyrylbenzene (DSB) units substituted with rigid, bulky cyclohexylmethoxy and cyclohexylethoxy groups. The rigid blocks are linked to flexible α,ω-nonamethylenedioxy chain spacer through ether linkage. The structural, morphological, thermal and photo-physical characteristics of the synthesized polymers are studied in detail. Noticeable differences in properties arising through the substituent effects are observed for both the polymers. Detailed studies bring out quite interesting structure-property relationships between the substituents introduced in the synthesized copolymers and their crystalline properties, thermal characteristics, optical properties, photoluminescence emission and fluorescence quantum yield. Polymer light emitting diodes (PLEDs) employing these segmented polymers as emissive layers are assembled and characterized to establish their suitability for lighting applications. Using the architecture, ITO/PEDOT:PSS/**NPPV1**/LiF-Al, polymer light emitting diodes (PLEDs) are assembled and as the first step of device characterization, their current-voltage characteristics are studied to establish the device behavior and find out the onset voltage. The emission characteristics of the devices are then studied using Ocean Optics USB 2000 spectrometer integrated to a computer using a dedicated program. The assembled devices show Schottky junction like behavior in the current-voltage characteristics and electroluminescence emission in the blue green region with appreciable intensity at the onset voltage of 8.8 V. It is highly desirable to develop polymers showing emission in the high frequency,blue region, using cost-effective synthesis routes. The novel approaches adopted in the synthesis of the monomers and the corresponding copolymers to achieve the anticipated structure-property relationships suitable for the effective designing of polymer light emitting diodes are the highlights of the present work.

## 1. Introduction

Research on light emitting polymeric systems is gaining momentum since they constitute a new class of materials possessing the advantages of the potential to develop thin, flexible and light weight displays for portable electronics with high brightness, low operating voltage, color tunability over the entire visible spectrum, wide operating temperature range and authentic image quality, using comparatively simpler and cost effective synthesis routes. Light emitting conjugated polymers such as polythiophenes (PT), polyphenylene vinylenes (PPV), polyphenylene ethynylenes (PPE) and polyflourenes (PF) are being screened for potential applications [1–4] and PPVs find applications in various fields

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ORIGINAL ARTICLE

# Self-assembled methyl-ammonium lead bromide thin films with blue photoluminescence

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## Abstract

Organic–inorganic metal halide perovskites (OIMHPs) are proving to be disruptive for the conventional silicon solar cell technology with conversion efficiencies breaching 29% using OIMHPs based hybrid structures. Synthesis of the colloidal Methyl-ammonium lead bromide ($CH_3NH_3PbBr_3$) quantum dots was done using Ligand-Assisted re-precipitation strategy. Subsequently $CH_3NH_3PbBr_3$ thin films were grown using these quantum-confined nano-particles by means of a simple solvent evaporation-induced self-assembly technique. Structural analyses of the colloidal nano-particles and thin films were done using High-Resolution Transmission Electron Microscopy (HR-TEM), X-ray diffraction and Raman spectroscopy. The crystal symmetry could be assigned to the *Pnma* space group with $a = 7.94$ Å, $b = 11.55$ Å and $c = 8.15$ Å. Different to the green photoluminescence exhibited by bulk $CH_3NH_3PbBr_3$, the thin films grown by us exhibit intense blue photoluminescence at a wavelength of ~ 488 nm with lower intensity emissions at ~ 463 nm and ~ 429 nm at room temperature. The uniqueness in blue emission from $CH_3NH_3PbBr_3$ thin films grown by us is modeled based on the presence of excitons in this system.

**Keywords** 2D Nano-platelets · Thin films · Blue photoluminescence · Perovskite · Excitons

## Introduction

Blue luminescent materials are being widely explored because of the opportunity they present for the next wave of optoelectronic devices. Today, a plethora of literature on the organic–inorganic hybrid perovskites are available that describe them as one among the most potent materials for luminescent optoelectronic devices in the green wavelength region. (Tan et al. 2014; Yao et al. 2019; Deng et al. 2016) Improvement in the luminescence efficiency of this class of materials has been achieved by defect passivation, engineering plasmonic structures, fabricating multiple quantum well structures etc. (Protesescu et al. 2015; Baikie et al. 2013; Yamada et al. 2015; Chaudhary et al. 2019). Hybrid perovskites have low exciton binding energy. An effective strategy to enhance the radiative recombination in this hybrid materials could be by facilitating the formation of nano-grains which would in turn confine excitons and yield higher luminescence yields.

Ligand-assisted re-precipitation methodology is a powerful technique for growth of nano-crystals. (Raj et al. 2265; Vickers et al. 2020; Xu et al. 2019) The method involves mixing of precursors into a good solvent which is then introduced into a vigorously stirred anti-solvent along with long-chain ligands. The role of ligands is to assist in controlling the crystallization, thereby forming colloidal nanoparticles. Nanoparticles have high surface-to-volume ratio, due to which charge equilibrium may be established with the stabilization effect of ligand. The technique involves a solvent engineering process where the nucleation as well as the growth of the product is controlled by introducing the precursor solution to the anti-solvent.

Methylammonium lead bromide ($CH_3NH_3PbBr_3$) perovskite shows exciton absorption for all of the three phases in which it crystallizes and based on which an exciton binding energy of 40 meV has been estimated. (Baranowski and Plochocka 2020) This low binding energy makes them very attractive for devices like optical sensors, solar cells and light emitting diodes. Since the exciton binding energy is close to room temperature thermal energy, there is a probability of obtaining excitonic transitions in the

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RESEARCH PAPER

# Copper-doped cesium lead bromide colloidal nano-platelets

**Ramakrishnan Jayakrishnan · Ramesh Chandran · Aruna R. Raj · Sreekanth J. Varma**

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**Abstract** We have used ligand-assisted re-precipitation (LARP) technique to grow colloidal nano-platelets of Cu-doped cesium lead bromide ($CsPbBr_3$) perovskite in room ambient. Using selected-area diffraction and transmission electron microscopy, the structure of the nano-crystals was identified to be the orthorhombic crystal phase. From green emission (520 nm) for the un-doped $CsPbBr_3$ nano-crystals, we were able to shift the emission to blue (464 nm) for the 1% doped $CsPbBr_3$ nano-platelets. As the doping concentration was increased, the edge length of nano-platelets increased and resulted in a decrease in the Stokes shift. Optical band gap was found to increase from 2.6 eV for the un-doped $CsPbBr_3$ to 2.81 eV for the 2% doped sample. We report that the formation of excitons with binding energy in the regime 70–110 meV is responsible for the blue photoluminescence. The green emissions have been identified to be due to defect levels located at 210–380 meV below the conduction band edge. The PLE peaks exhibit no shift with increasing excitation wavelength signifying quantum confinement effect. The substitution of lead with copper provides an opportunity in making lead-free perovskite solar cells in the near future.

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**Keywords** Colloidal nano-particles · Excitons · Perovskite · $CsPbBr_3$

## Introduction

Inorganic cesium lead halide ($CsPbBr_3$) perovskite nano-crystals (NCs) have attracted significant interest in various optoelectronic applications, including solar cells (Chang et al. 2016), lasers (Park et al. 2016), photo detectors (Song et al. 2018), and light-emitting diodes (LEDs) (Rao et al. 2018). $CsPbBr_3$ NCs are promising candidates for opto-electronic device fabrication due to their excellent properties such as narrow, intense, and tunable emission; low trap state density; improved stability; high luminescence quantum yield (80%); and charge transport properties (Protesescu 2015; Yakunin 2015; Kulbak et al. 2015a; Yettapu et al. 2016). They exhibit high carrier mobility (~4500 $cm^2\ V^{-1}\ s^{-1}$) and large diffusion length (> 9.2 μm) (Kulbak et al. 2015a). Phonon modes in colloidal $CsPbBr_3$ NCs are noted in the range of 0.5 to 7.0 THz (Yettapu et al. 2016). It has been reported that $CsPbBr_3$ in powder form can emit bright green light (Quan et al. 2017; Wang et al. 2015). Isolated nano-structures of $CsPbBr_3$ are reported to lase under optical pumping frequency (Eaton et al. 2016; Fu et al. 2016). Large single crystals of $CsPbBr_3$ exhibit much weaker PL (Rakita et al. 2016). It was observed that the shape of colloidal $CsPbBr_3$ NCs through re-precipitation strategy depends on the capping

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# Mott variable range hopping transport in thermal evaporated vanadyl 2, 3 naphthalocyanine thin films

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## HIGHLIGHTS

- Novel organic semiconducting Vanadyl Tetra Tert butyl2, 3 Naphthalocyanine [VTTBNc] thinfilm are prepared.
- Morphological and structural studies respectively accounts for the defect free and stable thinfilm microstructure.
- Electrical charge transport properties of VTTBNc thinfilms are analyzed using Mott variable range hopping mechanism.
- Increase in thickness and substrate heating enhances the hopping conduction and a decrease in band gap energy.
- Hence VTTBNc thinfilms are suitable micro molecular materials for thermo electric applications.

## GRAPHICAL ABSTRACT

## ARTICLE INFO

*Keywords:*
Thin film
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Electrical conductivity
Variable range hopping
X-ray diffraction
Transport property

## ABSTRACT

Thin films of Vanadyl 2, 11, 20, 29, Tetra *Tert*-Butyl 2,3 Naphthalocyanines [VTTBNc] are prepared by means of Vacuum evaporation technique. The effect of thickness and substrate heating on electrical, optical, structural and surface morphological characteristics of the thin films are studied by means of various characterization techniques like DC electrical conductivity, UV–visible absorption spectra, X-ray Diffractogram (XRD), scanning electron microscopy (SEM) and atomic force microscopy (AFM). Electrical conductivity studies of thin film samples show an exponential variation with a negative temperature coefficient of resistance. Transport property like density of states near Fermi level decreases and hopping distance increase with the increase in thickness and substrate temperature.

## 1. Introduction

One of the first Phthalocyanine-type molecules to be synthesized was Naphthalocyanine with 56 conjugated Π electrons. The properties of naphthalocyanines are almost similar to the properties of phthalocyanines [1]. The compounds are dark green with a blue to purple lustre; sublimable; and they may be purified by crystallization from high-boiling solvents. *Tert*-Butyl addition to the naphthalocyanine

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RESEARCH ARTICLE | JULY 12 2021

# Morphological modification of cobalt oxide nanoparticles using zinc and optical investigation

L. R. Asitha ✉; S. Srijith; L. R. Aparna; ... et. al



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# Morphological Modification of Cobalt Oxide Nanoparticles Using Zinc and Optical Investigation

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**Abstract**

*Scaling down to nanosize leads to structural and morphological reorientation of materials. Synthesis route plays a vital role in the modified characteristics of the material, be it physical or chemical. Morphological alteration becomes advantageous for materials which find application as catalysts, battery materials and sensors. Transition metal oxides especially spinel cobalt oxide is widely used as active materials for Li ion batteries, gas sensors and catalyst in many industrial reactions where surface morphology matters a lot. Substitution of Co ion with a similar one such as Zn results in modified surface morphology with less varied basic structure. Here the surface smoothening gradually increases with increase in the concentration incorporated Zn ion with less varied phase purity though a cost-effective chemical precipitation method. Blue shifted optical absorption also indicates the presence of Zn ion inhibits the growth of cobalt oxide nanoparticles*

**Keywords :** Surface morphology, cobalt oxide, chemical precipitation

## INTRODUCTION

Synthesis technique alters the physical, structural as well as morphological behaviour of nanomaterials. Parameters such as concentration, pH of reagents ambient temperature, together with nature of the stabilising agents used modify the overall behaviour of a nanocrystalline material. The spinel cobalt oxide and its derivatives are under limelight for the near past because of its superior functions as battery material [1], gas sensor [2], magnetic storage device [3], active catalyst [4], biocidal agent [5] and supercapacitors [6]. The $Co^{2+}$ and $Co^{3+}$ions located at the interstitial tetrahedral (8a) and octahedral (16d) sites, respectively, of the close-packed face centred cubic (fcc) lattice formed by the oxygen ions, imparts the spinel $Co_3O_4$ most of its most sought-after responses [7,8]. Understanding of the various charge transfer interaction occur between these two differently valanced cobalt ions is very important for exploiting many magnetic, optical electrical and electrochemical applications since $Co_3O_4$ is an antiferromagnetic p type direct semiconductor [9] with Neel temperature 40K [10]. Incorporation a divalent or trivalent ion may be helpful for the structural exploration of the $Co_3O_4$ [11].

Chemical precipitation method using a stabilizer is one of the most popular methods to prepare nanomaterials in laboratory as it is cost effective, simple and generally involves low temperature treatments [12]. Here a two-step chemical method involving precipitation of the precursor followed by thermal decomposition is used to obtain the $Co_3O_4$ nanoparticles. Chemical precipitation method yields $Co_3O_4$ nanoparticles with phase purity and uniform size distribution if the reaction is carried out in a slow rate [13]. Understanding of surface morphology of nanomaterials are very important since enhanced surface effects make many of the materials a key attraction in many of the applications such as sensors, catalysts etc. Surface roughness and porosity are the two important parameters in such applications [13]. In literature many reports are available indicating modified surface structure with proper doping [14].

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ADVANCES IN SPACE RESEARCH

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# Potential – Current characteristics of lunar surface at average solar wind conditions

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**Abstract**

The plasma environment of the Moon is dominated by the solar wind- the most energetic particles from the Sun. In this paper, we present an analysis of Lunar Prospector Electron Reflectometer data from the selected time periods to predict the lunar surface electrostatic potential over the dayside and nightside with respect to the ambient plasma. Here average solar wind condition (when the electron energy is below 100 eV) data was used to predict the surface potential. We used probe theory to derive the potential values. On the dayside, the potential is 5 V and on the nightside, it reaches up to −82 V. The variations in electron temperature ($T_e$) values show strong dependence in the night side potential values. The potential reaches a value of −82 V at $T_e = 58$ eV. Our calculated values agree well with the values measured by the Electron Reflectometer instrument aboard the Lunar Prospector spacecraft. We investigate the variation of the electric field over the two regions and located a transition region on the surface where the potential value is almost zero. This region is most suited for exploration activities, as the region is free from hazards caused by surface charging.


*Keywords:* Surface charging; Lunar surface; Solar wind

## 1. Introduction

The Moon lacks a global magnetic field and atmosphere, its surface is exposed to all kinds of radiations as well as charged particles from the Sun. The interaction with the solar wind and the photoemission of electrons due to solar UV radiation cause the lunar surface to become electrically charged (Manka, 1973; Knott, 1973; Jackson et al., 2015). The surface of the Moon, like any object in plasma, charges to an electrostatic potential such that the net current incident on it is zero (Whipple, 1981). The Moon is composed of lunar regolith comprised of dielectric material and submerged in flowing plasma (solar wind). The lunar soil absorbs the particles of the solar wind plasma that are incident on the body. Thus the lunar soil contains a record of composition and energy of the ancient solar wind. Interactions of the lunar surface with the solar wind produce a lunar wake region in the anti sunward direction (Manka, 1973; Gharaee et al., 2015). The Moon charges in response to various currents due to solar UV radiation and solar wind charged particles. The four main sources of

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# Synthesis of SnS Nanoparticles for Next Generation Photovoltaic Applications

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## Abstract

Tin mono sulfide (SnS) is one of the promising materials for the development of photochemical cells, photo detectors, solid-state batteries, sensors, capacitors etc. Herein, we synthesized SnS nanoparticles by wet chemical method for next generation eco-friendly solar cells and other photovoltaic applications. It is the method which involves growing of nanoparticles in a liquid medium having different reactants. Tin chloride and Sodium sulfide were taken as the reactants. These SnS nanoparticles were characterized by spectroscopic, microscopic, and scattering techniques. From the absorption spectroscopy the prepared SnS nanoparticles have an average direct bandgap of 1.89 eV and indirect band gap of 1.24 eV which are suitable to act as an active layer for solar cells. Blue shift of bandgap indicates the phonon confinement effect and nanostructure of synthesized SnS. Moreover, from the Transmission Electron Microscopic images the uniform size formation of SnS nanoparticles with a size in range 2-5 nm that is acceptable for the gas sensing were confirmed. In the XRD analysis, the sharp and strong diffraction peaks indicates that the nanoparticles were well crystallized and were indexed to pure orthorhombic phase of SnS. Calculated lattice parameters and d spacing confirm the crystalline structure. Raman spectra also confirm the crystalline structure of SnS. The average particle size of SnS was characterized by Dynamic Light Scattering (DLS) measurement. The poly crystalline nature of SnS was found by SAED pattern. Thus, the synthetic methodology opens up the possibility of generating low-cost photovoltaic devices based on SnS film as an active layer through a scalable chemical pathway.

## Introduction

SnS possess wide potential applications. In research, because of structural, chemical, physical and luminescence properties of SnS the semiconductor nanocrystals are widely studied [1]. SnS nanoparticles show great promise in the field of photoelectric [2-3] and thermoelectric [4-5]

1) Oriental Insects
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# ON COMPLETENESS, SELF CENTEREDNESS AND HEREDITARY PROPERTIES OF $\mu^n$ – FUZZY GRAPHS

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## Abstract

To avoid some limitations of fuzzy graphs, we introduced an advanced type of fuzzy graph named $\mu^n$ – fuzzy graphs (MFG) in [7]. Molecules with Covalent bond can easily converted into $\mu^n$ – fuzzy graphs, the model is introduced, completeness, self centeredness and hereditary properties of $\mu^n$ – fuzzy graphs are defined and various properties and theorems related to it are discussed in this paper.

## 1. Introduction

Graph theory is now a key component of applications in maths and is considered as combinatoric division. A graph is generally utilized device for fixing complex troubles in various fields in all major branches of mathematics. The essential aspect to notice is, whilst we have doubt about vertex/edge/vertex-edge, representation suit with fuzzy-graph. To overcome some limitations of fuzzy graph, authors already established a latest version of fuzzy-graph, namely $\mu^n$ – fuzzy graphs (MFG). In this paper, authors introduced various properties and theorems of $\mu^n$ – fuzzy graphs. Figure shows a concrete specimen of a fuzzy-graph.

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