VIDEO ARTICLE

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Organo – Clay Hybrid: Promising Candidate For Optoelectronics Applications

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Abstract

In this lecture, the introduction about the research activities going on at our laboratory will be presented with a special emphasis on our ongoing work on organo – clay hybrid thin films.

Nano-dimensional clay materials have attracted great interest as host materials over the past decade because of their unique interlayer spaces, flat large surface, negatively charged layer, and ion-exchange properties, intercalation and exfoliation / stacking ability of the nanosheet of clay; and modifiability of their surface with ionic / neutral organic molecules.

It is well known that molecular structure not only determines its properties but also its patterns when assembled onto different restricted geometry and in ultrathin films. It has been observed that the photophysical and photochemical properties of organic molecules markedly when incorporated into clay materials. The planarity of the π-conjugated system of the confined organic molecule is increased, which extends the π-conjugation length. Also, the fluorescence quantum yield of the dyes is enhanced due to the suppression of vibrational motion of the confined molecules. In addition, aggregation pattern of the dye molecules changes markedly when assembled onto clay layers. Accordingly, organic molecules confined in nano-order clay−organic hybrid systems often exhibit unique opto-electronic properties that are not observed in their solution or crystalline states.

The research has been motivated by the purpose of developing functional materials such as sensors, electrode-modifiers, nonlinear optical devices and pyroelectric materials, energy transfer, different order aggregates etc.

Various techniques such as Langmuir – Blodgett (LB), spin coating, Layer-by Layer (LbL) self assembly, suction - filtration (self-standing films) etc. can be used to prepare clay-organic hybrid films. With a suitable choice of molecules & film deposition techniques films can be prepared, which show improved mechanical stability, nonlinear optical (NLO) properties, two photon absorption (TPA), J dimer and fluorescence resonance energy transfer (FRET), colour switching properties etc.

References

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Biography of Presenting Author

S. A. Hussain is working as Professor in the Department of Physics, Tripura University (A Central University). His major fields of interest are Thin Film and Nanoscience: Organo-clay hybrid, FRET, Biosensor, Biomimetic Surfaces, resistive memory etc. He was a Postdoctoral Fellow of K.U. Leuven, Belgium during 2007 – 2008. He has undertaken several research projects funded by UGC, DST, CSIR, DAE etc. Dr. Hussain has published more than 140 research papers in international journals, written two books and edited two books. He is working as Editorial Board Member of five journals including Heliyon (Elsevier; IF= 3.775). Prof. Hussain is associated with several other professional societies like APS, INSA, PANE, MRSI, IPA etc. Prof. Hussain has already guided ten Ph.D. scholars and three M. Phil. students. Prof. Hussain has research collaboration with several groups in India and abroad. He has visited eleven countries and attended several scientific conferences in India and abroad. He earned several recognitions in professional area – few of them are – Jagdish Chandra Bose Award 2008-2009, TSCST, Govt. of Tripura; Young Scientist Research Award by DAE, Govt of India, Visiting Scientist by K. U. Leuven, Belgium, Yamaguchi University & Osaka University, Japan, Best Paper award in 96th ISCA, Felicitation by Asiatic Society of Bangladesh etc.

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