Session I: Functional Colorants

Design and synthesis of functional dyes for electronic devices

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Dr. K. R. Justin Thomas graduated from The American College at Madurai with an M.Sc. in Chemistry in 1990. He went to Indian Institute of Technology Kanpur for his doctoral work in the area of inorganic heterocycles. After gaining his Ph.D. in 1995 he joined the Sophisticated Analytical Instrumentation Facility (SAIF) at IIT Madras to implement a DST sponsored young scientist scheme. He proceeded to Institute of Chemistry, Academia Sinica, Taipei in 1997 and served as a post-doctoral fellow for five years before moving to the Department of Chemistry, University of Massachusetts at Amherst for a year (2003-2004) as a research associate. Prior to joining as Assistant Professor in 2006 at IIT Roorkee, he again served as senior post-doctoral fellow at Academia Sinica, Taiwan for two years (2004-2006). He is currently serving as Associate Professor of Chemistry at the Indian Institute of Technology, Roorkee.

His research work is focused on the development of organic and organometallic dyes suitable for application in electronic devices such as organic light-emitting diodes and dye-sensitized solar cells. He has successfully completed three sponsored (DST, CSIR & BASF) projects and three research projects are being implemented. He has published ninety seven research papers in international journals and co-authored five patents. He has supervised six Ph.D. theses and six M. Tech. dissertations. Currently seven students are registered for PhD under his guidance.

Abstract:

Organic dyes have been increasingly used in the fabrication of electronic devices such as organic light-emitting diodes, bulk heterojunction solar cells, dye-sensitized solar cells and field effect transistors due to their tunable charge transporting and emission characteristics. The nature of building blocks fundamentally determines the functional properties of the organic materials. At the same time, topological facets also play an important role and should be addressed carefully in the design of new materials. The knowledge of how topology affects the properties of the materials such as optical spectra, electronic energy levels, and transport properties is an important topic and deserves attention. We demonstrate using suitably designed organic dyes that efficient organic light-emitting diodes and dye-sensitized solar cells can be achieved. Heterocyclic chromophores and polyaromatic hydrocarbons have been used as building blocks to assemble functionally efficient organic dyes. Approaches toward the optimization of organic materials for efficient functioning in electronic devices will be presented.