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Synthesis and characterization of organic mechanoluminescent materials

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Mechanoluminescence (ML) is a phenomenon where light emission is induced by a mechanical action on a solid. The ML is classified into fracto-, plastico- and elástico-MLs according to an excitation mode of the electrons. When the material structure is fractured then the electrons are excited to the higher energy levels followed by the relaxation process of electrons to lower energy levels. The energy difference is released as a light. This kind of luminescence is observed as a result of the plate force during and just earlier to earthquake. The ML was also detected by a peeling of the tape in a vacuum. We have synthesized the europium doped dibenzoylmethide triethylammonium as an organic mechanoluminescent material. The synthesis was completed at a very low temperature of 70°C by a controlled slow cooling method. The synthesized material showed a very strong mechanoluminescence at 612 nm in the visible region. In this study, the ML material has been synthesized with an addition of 1-ethenylpyrrolidin-2-one [(polyvinylpyrrolidone) (PVP)]. We have investigated effects of the ligands, EuI₂, EuBr₂ and EuCl₂ on the ML substance structure, molecular orbital electron distributions of the ligands and the ML and the photoluminescence. The ML material structure was characterized by using the nuclear magnetic resonance spectroscopy (NMR), X-ray photoelectron spectroscopy (XPS), X-ray diffraction (XRD) and Gaussian DFT/B₃LYP/6-31G (d,p) software. The ML properties were observed by using the multichannel spectroscopy.

Biography

Kenji Murakami has completed his PhD in the year 1983 from Osaka University, Japan. He is working as a Professor in the Department of Engineering, Graduate School of Integrated Science and Technology, Shizuoka University. He has published seven book chapters, more than 100 papers in reputed journals and has been serving as a Referee of reputed journals.

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