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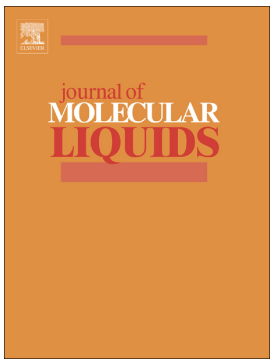

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Phenothiazine based nanocrystals with enhanced solid state emission

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Abstract

The paper focuses on the preparation of phenothiazine based nanoparticles, both in liquid and solid states, by reprecipitation in water and solvent induced phase separation respectively. Polymethylmethacrylate was used as an inert matrix and polyfluorene as a luminescent matrix. The morphological features of the nanoparticles were investigated by dynamic light scattering, and SEM, AFM and POM microscopy, which revealed their supramolecular ordering as nanocrystals. Their photophysical behaviour was monitored by UV-vis and photoluminescence spectroscopy. The nanocrystals emitted green light, with higher efficiency compared to the bulk crystals, reaching an absolute quantum yield of 35 % in water, 45 % in polymethylmethacrylate, and 39 % in polyfluorene.

Keywords: phenothiazine, nanocrystals, efficient luminescence, polymethylmethacrylate, polyfluorene

Introduction

Nanoparticles are a class of nanomaterials intensely studied in the last decades due to their outstanding properties, which make them promising for optoelectronics (light emitting devices, transistors, solar cells) and bioengineering (imaging, ultrasensitive detection at molecular and cellular level, drug delivery) [1-4]. Among nanoparticles, remarkable endeavour has been directed to the development of inorganic crystals (e.g. quantum dots) and conjugated polymeric nanoparticles. On the other hand, the nanocrystals based on organic low molecular weight compounds were less studied, despite the fact that they are cheaper, biologically more compatible and environmentally safer, bringing the advantage of reversible assembling/disassembling by crystallization/dissolving processes, and thus prompting an easy recycling [5,6]. The main drawback which hampered the developing of the organic

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