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New dansyl labeled polysilane: synthesis, characterization and sensor application

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Abstract

This work describes a polysilane-dansyl graft copolymer obtained by addition of N-methacryloyloxyethylcarbonyl-5-(dimethylaminonaphthalene-1-sulfonohydrazine) to –Si-H reactive groups of poly[methyl(H)-co-diphenyl]silane. The synthesis approach is thermally initiated by 1,1'-azobis (cyclohexanecarbonitrile) as a radical hydrosilylation process promotor. The resulted material is a complex fluorescent nanocomposite which combines the optical properties of several chromophores like the methylhydrosilyls and diphenylsilyls segments, dansyl moieties and silicon quantum dots. Attachment of the dansyl moieties directly to the sigma conjugated chain of polysilane results in a strong emission signal in the visible region. Conventional FTIR, ¹H-NMR, GPC, TGA and UV-Vis analysis were used to evidence the chemical structure in relation with the optical properties. Since the signal corresponding to the silicon quantum dots is also present the nanocomposite could be used in a multichannel detection system in biological environments. The sensing capacity toward some particular cations has been successfully tested.

Keywords: polysilane, dansyl, sensor, fluorescence, silicon quantum dots, synthesis

Introduction

Combining different molecules with fluorescence properties in the same matrix (two chromophores or a conjugated structure with a fluorophore) can lead to interesting fluorescent characteristics of the final material, offering the opportunity to expand their application domains and therefore this field is intensive studied [1-3]. One of the applications of high interest is the fluorescence sensing, an extremely sensitive method which is capable to detect to the level of single molecules [4]. A considerable number of papers have focused on the design and the development of fluorescent

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