Immobilization of perylene and pyrene dyes in SBA-15

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The SBA-15 is an important class of molecular mesoporous material because of its surface area, ordered pore structure hexagonally aligned throughout the surface of the material [1]. Amino-functionalized mesoporous silica have been found to be useful for some base-catalysed reactions or further post-synthesis functionalization [2]. In the field of biomedical applications of particular interest is the functionalization of mesoporous silica with fluorescent molecules or dyes. The spectral fluorescence properties of perylenes and pyrenes incorporated at the SBA-15 are the interest in our group for the application as a sensor. In this work the SBA-15 materials were first treated with alkaline solution in order to increase the amount of surface silanol (Si-OH) groups that can be used in subsequent functionalization. The functionalized was carried out with amine groups through post-synthesis using aminopropyl triethoxysilane (APTES). The resulting functionalized material was investigated as matrix for the immobilization of perylene-3,4, 9,10-tetracarboxylic dianhydride (PTDA). Compared with the pristine SBA-15 substrate, red-coloured samples were obtained when it was functionalized with the PTDA molecule exhibiting absorption bands at λ = 480 nm. Further exploring immobilization of 1-Pyrenecarboxaldehyde on amino-SBA-15 is detailed. The obtained materials were characterized by FTIR and fluorescence spectroscopy, carbon dioxide and nitrogen adsorption analysis, X-ray diffraction (XRD), solid-NMR was used to determine structural details, and transmission electron microscopy (TEM). The textural characterization show the decrement of the average pore and of surface area as consequence of the APTES and fluorescent dyes functionalization. Furthermore, the characterization suggest the possibility of use these materials as sensors or coupling substrates for diverse applications

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