Luminescent lanthanide-MOFs coatings on oxide glasses for sensing applications

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Sensors based on optical fibers become a promising alternative for remote sensing, allowing in-situ and faster responses [1]. Fiber-based sensors, however, require a chemosensor agent to generate the signal to be detected. In this sense, lanthanide metal-organic framework (Ln-MOFs) has shown great potential for sensing several analytes, such as gases and volatile organic compounds (VOCs) [2,3]. This work aims to develop sensors based on optical fibers coated with luminescent Ln-MOFs for remote sensing. Oxide glasses were used as a substrate for the in-situ growth of Ln-MOFs synthesized from $EuCl_3$ and carboxylate ligands, specifically trimesic (1,3,5-benzene tricarboxylic) and pyromellitic (1,2,4,5-benzene tetracarboxylic) acids. The Ln-MOFs were deposited on glass bulks and optical fibers and had its structural and photoluminescent properties investigated. In Fig. 1(a) and 1(b) it are seen the photographs of glass samples coated with [Eu(BTC)(PDC)]n and [Eu(B4C)]n which present an uniform coating layer on the entire glass surfaces. Also, the Figures 1(c) and 1(d) shows the intense luminescent when the samples are illuminated under UV light.

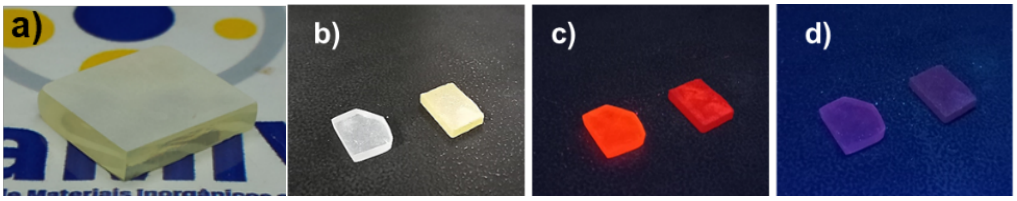

Fig. 1. Photographs of (a) TZN glass coated with [Eu(BTC)(PDC)]; (b) TZNF15 and TZN samples coated with [Eu(B4C)] without irradiation and under UV-light at (c) 254 nm and (d) 365 nm.

Then the composite TZNF15@[Eu(B4C)] was exposed to different organic analytes carried by nitrogen and photoluminescence measurements were acquired in real-time. Especially for acetone, a luminescence quenching was verified due to a lower transfer of energy from the ligand to the lanthanide ion. Excited at 420 nm, the composite presents two main emissions: a broad band centered at 566 nm and a characteristic Eu^{3+} transition at 614 nm. Thus, we can state that this system presents an "antenna effect", with a significant energy transfer from the ligand to the metallic center.

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