PÔSTER - RESUMO - MATERIAIS E BIOMATERIAIS

SYNTHESIS AND PHOTOPHYSICAL INVESTIGATION OF POSS-BASED FLUORESCENT MATERIALS FOR PHOTOCATALYTIC AND OLED APPLICATIONS

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A class of materials that has gained increasing prominence in recent years is polyhedral oligomeric silsesquioxanes (POSS), cyclic polymers derived from siloxanes. These materials can present a variety of structures, such as a polygonal “cage-like” structure (POSS) and a ladder-type structure (LPSQ), and are of great interest due to the wide range of possible synthetic routes and the large number of compounds that can be coupled to these structures. This versatility provides the final products with significant flexibility and results in interesting thermal, electrical, and optical properties 1. In this work, four hybrid POSS materials synthesized from silsesquioxane were developed using emitting moieties derived from fluorene, thiophene, and tetrazine, identified as L1, L2, L3, and L4. Photophysical characterization of these samples showed broad absorption spectra for L1 and L2 within a similar range of approximately 310–330 nm, whereas L3 exhibited a more well-defined absorption spectrum, with two main bands at 286 and 331 nm and a smaller shoulder at 389 nm. The emission spectra of L1 and L2 displayed similar profiles. L1 presented two main

bands at 370 and 391 nm and a red-shifted band at 574 nm. L2 exhibited a single main band at 338 nm and another band at 433 nm. The red-shifted bands observed at 574 and 433 nm for L1 and L2, respectively, are associated with aggregation effects, which are well known in fluorene and fluorene-based polymers. In contrast, the emission profile of L3 showed a single band at 501 nm, with no evidence of aggregation. Based on the photophysical characterization results, a photocatalytic assay was performed in an aqueous medium in the presence of Rhodamine B under UV irradiation to evaluate this potential application. The results indicated that the best-performing compound, L3 (derived from thiophene and tetrazine), exhibited catalytic activity, removing 19% of the initial dye concentration after 60 minutes and 58% after 240 minutes. These findings suggest the potential application of this material in photocatalysis, particularly for the degradation of organic compounds, due to its optical properties and its ability to form polymeric networks. Furthermore, this research provides a foundation for the future development of related materials, such as hybrid systems based on silsesquioxanes—specifically POSS (polyhedral oligomeric silsesquioxane) and LPSQ (ladder-type silsesquioxane)—and fluorene-derived semiconducting polymers synthesized via the Heck reaction. These materials are intended for use as efficient emissive components in the active layers of organic light-emitting diodes (OLEDs), aiming to produce devices that combine mechanical flexibility with electronic, thermal, and optical properties, extended operational lifetime, potential color tunability, ease of processing, and enhanced material durability.

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Referencias:

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Palavras-chave: poss; silsesquioxanes; organic electronics; luminescence.