PÔSTER - RESUMO - DISPOSITIVOS OPTOELETRÔNICOS

CORRELATIONS BETWEEN STRUCTURE AND MAGNETIC PROPERTIES OF NEODIMIUN CONTAINING POLYMERS

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Rare earth elements (REEs) have become extremely important in various sectors, including energy, electronics, defense, and quantum technology. The unique structure of the 4f electron shell of the lanthanide elements confers exceptional magnetic, optical, and catalytic properties, making REEs indispensable for numerous applications. These elements are widely used in permanent magnets, rechargeable batteries, optical sensors, functional coatings, catalysts, and other high-performance materials. This enables the development of products such as wind turbines, electric vehicles, low-energy LED lighting, and high-resolution displays [1,2].

Considering the unique advantages of rare earth elements (REEs), this work aimed at the synthesis of metallopolymers with alternating structures. Among the synthesized materials, particular emphasis is given to Poly[9,9'-dioctyl-2,7-fluorene)-3,8-(1,10-phenanthroline)] containing neodymium ions (LaPPS59Nd³?). The structures were designed to contain different proportions of neodymium (Nd) units in the polymer chain, in order to induce or favor interactions that promote greater coupling and local organization of magnetic moments, depending on the mode of metal incorporation into the polymer matrix, consequently resulting in improved magnetic properties.

The synthesis was carried out following conventional routes for obtaining conjugated polymers via Suzuki cross-coupling polycondensation, with the necessary adaptations for the desired structure. The structures of the polymers LaPPS59 and LaPPS59Nd³? were confirmed by infrared spectroscopy and ^{1}H and ^{13}C nuclear magnetic resonance. The neodymium content in the material was estimated from the inorganic residue observed in the thermogravimetric analysis (TGA) curves, indicating successful incorporation of the metal into the polymer matrix [3].

The analysis of the photophysical properties of the synthesized compound allowed the identification of absorption and emission bands, also revealing material disaggregation after complexation. Magnetic measurements indicated that LaPPS59 (pure polymer) exhibits diamagnetic behavior. After complexation with Nd³? ions, the resulting metallopolymer (LaPPS59Nd³?) exhibited ferromagnetic behavior at room temperature. However, when complexation was performed with Nd (DBM)3, leading to the loss of interchain p–p stacking, the ferromagnetic component was suppressed, and the samples displayed paramagnetic behavior.

References:

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Palavras-chave: rare earths; metallopolymers; neodymium; magnetic properties.