INCORPORATION OF THE COMPLEX Eu^{3+}-PHEN IN POLYAMIDE MEMBRANE OBTAINED BY ADDITIVE MANUFACTURING

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The Rare Earth elements or lanthanides are essential for hundreds of applications. Their versatility and specificity have made them stand out in the technological, environmental, and economic areas even more than initially expected. Their physicochemical properties like electric, magnetic, and optical features have led to their increasing use in luminophores, lasers, magnets, batteries, magnetic cooling, superconductors, and hydrogen storage, among others. Additive manufacturing or 3D printing consists in producing pieces with different shapes and complexity from a range of polymeric materials. These pieces can have their surface modified and molecules incorporated into their structure via the sol-gel methodology. By combining lanthanides with the sol-gel process and additive manufacturing, we can achieve interesting materials with application in light emitters for use in cancer photodynamic therapy, which is a less aggressive treatment for skin cancer. This study aimed to incorporate lanthanide complexes into polyamide membranes obtained by additive manufacturing and take advantage of the luminescent properties of these ions to study light emission at wavelengths suitable to sensitize a drugs cocktail applied in photodynamic therapy. The polyamide membranes were first treated with diluted acetic acid, washed, and dried in an oven. The Eu^{3+} complex with the ligand 1,10-phenanthroline was incorporated into the membranes by *casting*, which consisted in placing the membrane in contact with the Eu^{3+}complex solution and leaving the system to stand until the solvent had evaporated completely. After Eu^{3+} complex incorporation, the membrane was coated with transparent polyimide. The excitation spectra displayed the typical metal-ligand charge transfer band at 350 nm, relative to the ligand. The emission spectra presented the characteristic bands of the electronic transitions from the excited state $^5D_0$ to the fundamental state ^7F_J, which indicated Eu^{3+} complex incorporation without any alterations in the structure. The vibrational analyses showed that, after treatment at 130 ^oC, the polyimide used in the coating remained structurally unaltered. Incorporation of electromagnetic radiation emitters into flexible polyamide membranes with transparent coating paves the way for research into the incorporation of sensitizers for application in photodynamic therapy with reusable systems.

Keywords: Sol-Gel, photodynamic therapy, polyamide, transparent coatings