

PVP films doped with silver nanoparticles and Eu³⁺ complexes for use as optical markers

Ashley Andersson Santos Santana de Jesus¹, Luana dos Anjos Souza², Liana Key Okada Nakamura², Paulo Roberto da Silva Santos³, Ercules E. S. Teotonio⁴, Maria C. F. C. Felinto⁵, Oscar Loureiro Malta⁶, Hermi F. Brito⁷

¹Universidade de São paulo (*Departamento de Química Fundamental*), ²Instituto de Pesquisas Energéticas e Nucleares, ³Instituto de Pesquisas Energéticas e Nucleares (*Instituto de Química*), ⁴Universidade Federal da Paraíba (*Departamento de Química*), ⁵Instituto de Pesquisas Energéticas e Nucleares (CEQMA), ⁶Universidade Federal de Pernambuco, ⁷Universidade de São Paulo

e-mail: ashley.jesus@usp.br

Metallic nanoparticles (Au and Ag) that exhibit the Localized Surface Plasmon Resonance (LSPR) effect are emerging as strategic associates of Ln³⁺ compounds. When functionalized with these complexes, such nanomaterials intensify luminescence, amplify monochromatic emissions, and allow adjustment of emission lifetimes, in addition to enabling control of polarization on a nanometric scale. It is worth mentioning that Ln³⁺ coordination compounds have been an important field of research due to their unique spectroscopic properties. These compounds generally present high emission intensities, with characteristic colors originating from the metal center, making them promising for biological sensor applications. Recent research involving immunoassays with lanthanide-based luminescent markers has focused on improving sensitivity and selectivity in detection processes. Thus, this work reports the preparation of polymeric films based on polyvinylpyrrolidone (PVP), doped with different concentrations of the Eu(TTA)₃(TOPO)₂ complex and silver nanoparticles (AgNPs), as well as the detailed study of their photonic properties by static and time-resolved luminescence spectroscopy. The synthesized thin films presented narrow bands centered on the intraconfigurational transitions of the Eu³⁺ ion (⁵D₀ → ⁷F_J, J=0-4), exhibiting characteristic red emission according to the chromaticity diagram. In addition, the films presented intrinsic emission quantum yield values higher than 70%, which indicates that the studied system has effective luminescence and potential application as an optical marker.

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