Rare earth nanomaterials for bio-application and theranostic

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Luminescent materials, the so-called fluorophores, have been played a role in the diagnostic area over the years. In last decades, luminescent rare earth nanomaterials are receiving increasing attention due to its wide range of potential applications, including bioanalytical, images, dye-sensitized solar cells, nanobiotechnology and catalysis[1-3]. Other promising applications of luminescence materials include radiation detection, sensors for structural damage, optical memory media, identification markers, medical diagnostics, optical probes for in vivo bioimaging, molecular thermometers, etc[1-4]. The feature spectroscopic properties of rare earth ions such as high intense emission bands, high color purity, long lifetime and high emission quantum efficiency make them strong candidates for use as markers or bio- selective detectors. Besides, the interest in developing nanoparticles (NP) associated with biological materials continues growing rapidly[1-4]. This interest is mainly motivated by the desire to simultaneously exploit the optical properties of both the NP and biological components in new hybrid operating devices or luminescent materials that can be applied in strategic biomedicine areas. Nowadays researchers have given special attention to materials that display dual functions as marking the biological material by luminescent process and destroy malignant cells. This statement is based on the association of properties in the same material, as luminescence and magnetism or light associated to the capacity to interact with a drug and guide this drug to the targets. These materials are assigned theranostic materials, where it is a concept of "the ability to affect therapy or treatment of a disease state", and the material play a role of marker and contributes in the therapy process. In this work, we present the luminescence study of various materials, synthesized and characterized in several laboratories that are part of the group of fluoroimmunoassays of inct-INAMI and NanoBio networks and are potential biophotonic materials to use as biomarkers. An attention to materials that emit in the regions of visible (Eu^{3+}, Tb^{3+}, Sm^{3+} and Dy^{3+}) and near infrared (Nd^{3+} will be discussed.

Keywords: Rare earth, nanomaterials, bio-application, theranostic.

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