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P21: Development of Rare-Earth-Doped Hybrid Materials Towards Luminescence Enhancement

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The rapid growth on the development of rare-earth-doped luminescent materials has been drawing attention due to complex energy converting systems that can be structurally engineered to tune absorption and emission wavelengths, outlining new materials and applications for photonics. [1, 2] In this scenario, this work presents the development of rare-earth-doped strontium aluminate phosphors prepared by the Pechini method and modified with 3-aminopropyltrimethoxysilane *via* microwaveassisted synthesis, integrating a silica network with rare-earth β-diketonate complexes in order to enhance the absorption section and promote energy-transfer processes within the system. The prepared materials were analyzed by X-ray powder diffraction, where a characteristic monoclinic $SrAl_2O_4$: Eu^{2+}, Dy^{3+} phase with crystallite size around 30 nm was observed. Several structural changes attributed to surface modification were also noted. Scanning Electron Microscopy images and Energy-Dispersive X-ray Spectroscopy results revealed the expected surface alteration effects, as well as the element mapping throughout the samples. Standard UV-Vis and Vacuum-UV Luminescence Spectroscopies were also performed. The optical behavior of the synthesized materials was characterized by green Eu^{2+} emission assigned to the $4f^65d^1 \rightarrow 4f^7(^8S_{7/2})$ interconfigurational transition under near-ultraviolet excitation alongside narrow 4f-4f transitions of non-reduced Eu^{3+}. Furthermore, in functionalized samples, $S_0 \rightarrow S_n$ transitions attributed to β-diketonate ligands were also observed, unveiling an increasing absorption section under ultraviolet light. Finally, it was noted a significant increase in the persistence decay time under near Band-Gap excitation in modified materials, suggesting interactions between the inorganic host-matrix, the silica network, and the β-diketonate complexes.

References:

[1] Y. Li, et. al.; Long persistent phosphors-from fundamentals to applications. *Chem Soc Rev.*, **2016**, 2090-2136.