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Editorial

Development and Applications of Transition Metal or Rare Earth-Based Luminescent Inorganic Materials

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This Special Issue is dedicated to luminescent inorganic materials, an extremely vast topic that often and willingly crosses over into other important fields of chemistry and physics. The seven papers collected in this Special Issue provide an idea of the potential applications of these materials and of the possible research developments in this area, both at an experimental and theoretical level.

Paterlini et al. [1] have synthesized a highly biocompatible hydroxyapatite via solid state reaction and studied its structural and morphological properties in depth. Doping with Eu^{3+} or Gd^{3+} has given the material interesting luminescence properties, of note for bio-imaging applications.

Song et al. [2] developed a rare earth metal-organic-framework RE-MOF loaded with rosebengal for the detection of highly explosive 2,4,6-trinitrophenol (TNP). The product obtained was characterized by various techniques (SEM, XRD, IR, TGA) and tested from an optical point of view both in the presence and absence of TNP at different concentrations. In addition to the promising performances of the material, the tests also highlight the validity of the methodological approach, which is based on the use of the rare earth emission (Eu^{3+}) as an internal reference.

The sub-micron-sized nanospheres of α-$NaYF_4$:RE^{3+} prepared by Fan et al. [3] possess morphological characteristics that make them attractive for different applications. After an accurate structural characterization, the authors carried out a systematic study on the excitation and emission properties of nanospheres activated with Eu^{3+}, Tb^{3+}, Ce^{3+}, Er^{3+}, and Tm^{3+} and then proceeded to the functionalization of some samples, with in vitro tests carried out on macrophages. These tests have highlighted the excellent prospects for the application of NH_2-$NaYF_4$:Eu^{3+} in bio-imaging.

Kucuk [4] dealt with the development of a series of ZnB_2O_4:Tb^{3+} phosphors, starting from acid solutions of the precursors, with their characterization by XRD and SEM techniques, and concluding with the study of their thermoluminescence (TL) properties. The results of the TL measurements as a function of concentration were analyzed using suitable kinetic models, which allowed for the conclusion that the materials produced have prospects for application in dosimetry.

The heptanuclear complex of Zn(II) synthesized by Deng et al. [5] exhibits luminescence properties sensitive to the presence of different metal cations, with a high specificity for Ag(I). Aside from its own inherent particularities of interest, the study provides the basis for the development of an analytical method for the detection of heavy metal ions.

The review by Krasnikov et al. [6] reflects the renewed and continuously growing interest in the emission properties of materials activated with Bi and revisits the state of the art with an original and accurate approach. The dynamics of the excited states are discussed on the basis of the comparison between the spectroscopic properties of different materials and in light of the different models proposed to account for the experimental observations. From their detailed analysis of literature data, the authors are able to identify a series of systematic behaviors and provide useful interpretative tools and ideas for future investigations.

Finally, the paper by Bodziony et al. [7] focuses on the characterization by electron paramagnetic resonance (EPR) of Ce^{3+} centers in a single crystal of $BaWO_4$. The results of this investigation provide

interesting, and in some ways surprising, information about the doping mechanisms in this system, which should also be kept in mind when studying the luminescence properties of this class of materials.

In summary, the articles presented in this Special Issue represent some of the hottest lines of research in the field of luminescent materials. I sincerely thank the authors for their significant and high-quality contributions, and I wish them the best for their future research. Finally, I thank the referees, the editorial office, and all those who contributed to the realization of this Special Issue.

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