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Bismuth-based Solid State Phosphors: Design, Structural Diversity, and Luminescence Properties

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Bismuth -containing phosphors contain multiple tetrahedral anions currently provide novel phosphors generation with improved functionality emerges, posing new challenges and opportunities in material science. The application of monovalent substitution by other rare-earth metals has been the focus of recent intense investigations because of the possible charge transfer processes, which brings the possibility of tailoring the luminescence properties of doped materials, thereby generation highly emissive compounds for useful applications such as light-emitting diods. The effect of dopant concentration, crystal structure, reagents reactivity and reaction medium on the growth of phosphor crystals. Understanding the role of various thermodynamic and kinetic parameters enables the controlled synthesis of complex gadolinium oxides that can exhibit unique tailored properties. Selected application prospects arising from such capabilities are then discussed.
One of the advantages of bismuth molybdate and tungstate hosts for RE ions is related with weak concentration quenching of luminescence that related with these ions, particularly Eu3+ ones.
Layered crystal structure of mixed-anion compounds studied with general formula A2R(PO4)(MO4), where A = Na or K; R = Y, Bi or RE; M = Mo or W. Although the first structure of this family, Na2Y(PO4)(MoO4), was reported more than three decades ago, there are some gaps in the studies of such compounds from viewpoint of both crystal structure and their physicochemical properties. The further studies of luminescence of K2Bi(PO4)(MoO4):Eu has been shown that its quantum yield is close to 96 % and 86 % when PL excitation performed at 394 and 465 nm, respectively.

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