High energy $4f^N \rightarrow 4f^{N-1}5d^1$ transitions of Eu^{2+}, Ce^{3+}, and Pr^{3+} in $BaZnP_2O_7$

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We report the spectroscopic properties of a $4f^N \rightarrow 4f^{N-1}5d^1$ transitions in $BaZnP_2O_7$. This host lattice is chemically similar to the known $BaMgP_2O_7$ pyrophosphate lamp phosphor. However, while Ba^{2+} ions are nine-coordinated in both host lattices, the Zn compound is triclinic while the Mg compound is monoclinic, and the average Ba-O bond length is larger in the Zn compound compared to the Mg compound (2.85 Å vs. 2.81 Å) [1,2]. The larger bond length is thought to be the cause of the higher energy Eu^{2+} $5d \rightarrow 4f$ emission in $BaZnP_2O_7$ compared to $BaMgP_2O_7$ (~385 nm vs. 400 nm) due to smaller crystal field and covalency effects. We will further investigate aspects the luminescence of Eu^{2+} in this host lattice such as quenching mechanisms and the presence of Eu^{2+} f-f transitions in comparison to other Eu^{2+} UV phosphors. Finally, we will also report on the luminescence of Ce^{3+} and Pr^{3+} in this host lattice to further understand the relationship between the $4f^N \rightarrow 4f^{N-1}5d^1$ transitions in these ions especially in comparison to Eu^{2+}.

[1] E. V. Murashova, Yu. A. Velikodnyi, V. K. Trunov, Russ. J. Inorg. Chem. **36**, 479 (1991).

[2] E. V. Murashova, Yu. A. Velikodnyi, V. K. Trunov, Russ. J. Inorg. Chem. **36**, 481 (1991).