Nature of Eu^{2+} and Ce^{3+} emission in the perovskite $BaHfO_3$

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The emission behavior of $BaHfO_3:Eu^{2+}$ previously has been shown to have a peculiar temperature dependence with red emission at low temperatures which blue shifts as the temperature is raised [1] (Figure 1). It has been proposed that this red emission could be due to a metal-metal charge transfer state between Eu^{2+} and Hf^{4+} [1], similar to $BaF_2:Eu^{2+}$, and the blue emission could be due to intrinsic Eu^{2+} emission [2]. Typically, host lattices containing d^0 transition metal ions such as Hf^{4+} will leads to strong quenching of emission from the lowest $4f^65d$ levels of Eu^{2+}. In this paper, we compare the luminescence of $BaHfO_3:Eu^{2+}$ with $BaHfO_3:Ce^{3+}$ and $(Sr,Ca)HfO_3:Eu^{2+}$ to understand the nature of the luminescence bands in $BaHfO_3$. These comparisons lead to the conclusion that the blue luminescence band is most likely due to intrinsic Eu^{2+} emission. The nature of the redder emission bands will be analyzed through time-resolved measurements and thermoluminescence excitation spectroscopy. Finally, in $(Sr,Ca)HfO_3:Eu^{2+}$, we believe that the emission bands in these materials are clear evidence of Eu^{2+} luminescence in a host lattice containing transition metal d^0 ions.

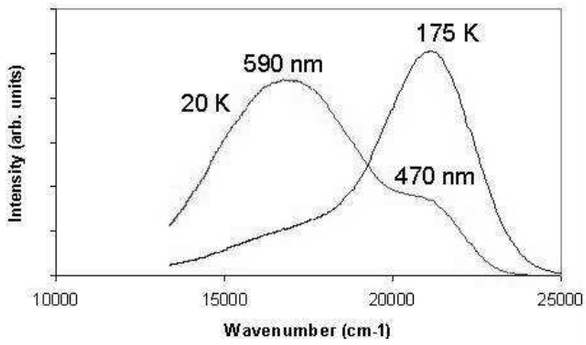

Figure 1. Emission spectra (λ_{ex}=285 nm) for $Ba_{0.999}Eu_{0.001}HfO_3:Eu^{2+}$

References:
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