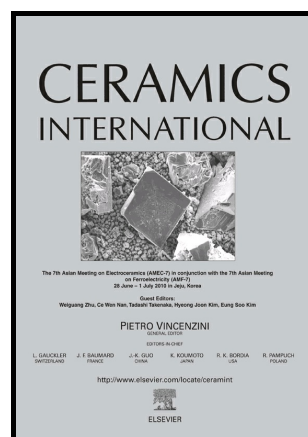


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Photoluminescence, Energy Transfer, and Thermal Stability of $\text{BaAl}_2\text{Si}_2\text{O}_8:\text{Bi}^{3+}$, Tb^{3+} Phosphors for w-LEDs

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Abstract

A series of Tb^{3+} or/and Bi^{3+} doped $\text{BaAl}_2\text{Si}_2\text{O}_8$ phosphors were synthesized via solid-state method. The structure, luminescence properties and thermal stability were investigated. The optimum concentrations of Bi^{3+} and Tb^{3+} were 1.5mol% and 7mol%, respectively. Furthermore, $\text{BaAl}_2\text{Si}_2\text{O}_8:0.015\text{Bi}^{3+}$ and $\text{BaAl}_2\text{Si}_2\text{O}_8:0.07\text{Tb}^{3+}$ phosphors emitted blue and green light and the emission color of $\text{BaAl}_2\text{Si}_2\text{O}_8:\text{Bi}^{3+}$, Tb^{3+} could be tuned from blue to green through the energy transfer. This energy transfer from Bi^{3+} to Tb^{3+} was confirmed and investigated by photoluminescence spectrum and decay lifetime. With constantly increasing Tb^{3+} concentrations, the energy transfer efficiency from Bi^{3+} to Tb^{3+} in $\text{BaAl}_2\text{Si}_2\text{O}_8$ host increased gradually and reached as high as 86.54%, the quantum yield was about 44.26%. The energy transfer mechanism ($\text{Bi}^{3+}-\text{Tb}^{3+}$) was proved to be dipole–dipole mechanism. The Tb^{3+} emission intensity can be considerably enhanced when monitored at NUV (377 nm) by co-doping Bi^{3+} ion. Moreover, the phosphor of $\text{BaAl}_2\text{Si}_2\text{O}_8: 0.015\text{Bi}^{3+}$, 0.07Tb^{3+} could exhibited strong green emission with good CIE chromaticity coordinate. The results indicate that $\text{BaAl}_2\text{Si}_2\text{O}_8:\text{Tb}^{3+}$, Bi^{3+}

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