



Photo- radio- and thermoluminescence of sintered transparent $\text{Al}_2\text{O}_3:\text{Eu}^{2+}$ in the range 15–800 K.

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Streszczenie

Photoluminescence, radioluminescence, and thermoluminescence of transparent alumina in the range 15–800 K is presented. Blue $4f^65d^1 \rightarrow 4f^7(^8S_{7/2})$ luminescence of Eu^{2+} exclusively under ultraviolet excitation at ~ 280 nm was observed and its thermal stability was evaluated. Excitation with X-rays produced violet broad band peaking around 380 nm as well as infrared luminescence of Cr^{3+} impurity around 694 nm due to the $^2E_g \rightarrow ^4A_{2g}$ transition. The temperature dependence of both these emissions was tested. The infrared luminescence could be effectively excited through broad bands peaking at ~ 400 and 550 nm. A Well-resolved vibronic structure of the 550 nm excitation band of Cr^{3+} is discussed. Significant red-shift of the Cr^{3+} luminescence was observed with increasing temperature. Both Cr^{3+} ion, as well as intrinsic defect(s) of F-type center, are active in thermoluminescence of that transparent ceramic material. Detailed analysis of thermoluminescence generated by the F-center showed a set of traps in a broad range of temperatures (40–570 °C). Their thermoluminescence is governed by first-order kinetics. Continuous distribution of trap energies was proved. A vacuum referred binding energy scheme including centers involved in the luminescence of the system is presented.

Słowa kluczowe

Alumina, Transparent ceramics, Eu^{2+} luminescence, Cr^{3+} , F-center

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