

Luminescence of Tb-doped $\text{Ca}_3\text{Y}_2(\text{Si}_3\text{O}_9)_2$ oxide upon UV and VUV synchrotron radiation excitation.

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Streszczenie

Powders of calcium yttrium silicate, $\text{Ca}_3\text{Y}_2(\text{Si}_3\text{O}_9)_2$, containing 0.1–3% Tb^{3+} were prepared using a sol-gel method and characterized with XRD, IR, UV-vis and UV-VUV spectroscopies at room temperature and 10 K. Structural analysis revealed pure monoclinic phase of $\text{Ca}_3\text{Y}_2(\text{Si}_3\text{O}_9)_2$ after heat-treatment at 1000 °C. Infrared spectroscopy showed that between 800 and 900 °C a short-range structural organization of the components proceeded, yet without crystallization. A strong emission of Tb^{3+} had been observed both in the green part of the spectrum due to the ${}^5D_4 \rightarrow {}^7F_J$ transitions and in the blue-violet region owing to the ${}^5D_3 \rightarrow {}^7F_J$ radiative relaxation. The color of the light could be tuned from yellowish-green to bluish-white both by means of the dopant content and the temperature of synthesis. Efficient luminescence of Tb^{3+} -doped $\text{Ca}_3\text{Y}_2(\text{Si}_3\text{O}_9)_2$ phosphors could also be obtained upon stimulation with vacuum ultraviolet synchrotron radiation demonstrating that an energy transfer from the host to the Tb^{3+} ions takes place.

Słowa kluczowe

Calcium yttrium silicate, Tb^{3+} luminescence, VUV excitation, exition

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