

Vibronic transitions of U^{3+} -doped $LaBr_3$ single crystals.

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Streszczenie

Good quality U^{3+} -doped $LaBr_3$ single crystals have been obtained by the Bridgman–Stockbarger method. High-resolution low temperature emission spectra were recorded in a wide spectral range and are discussed. The emission from the $2K_{15/2}$, $2H_{11/2}$, and $4F_{9/2}$ levels to the $4I_{9/2}$ ground state and from $2K_{15/2}$ to the first excited state $4I_{11/2}$, have been investigated and are discussed with respect to vibronic transitions. The registered vibronic lines were compared with the Raman spectra of $LaBr_3$ single crystals. [12]. The La^{3+} ions are coordinated by nine Br-ions in the shape of a tricapped trigonal prism. The $LaBr_3$ host crystal exhibits a maximum phonon energy at 168 cm^{-1} . Six Raman-active lines at 77 K (three E_{2g} , two A_g , and one E_{1g}) have been identified by Asawa [13]. Trivalent rare-earth (Ln^{3+}) as well as actinide (Ac^{3+}) ions substitute the La^{3+} ions at the same site symmetry. No hints of clustering or occupation of other lattice sites could be detected. In the 4,000–19,750 cm^{-1} region of the $U^{3+}:LaBr_3$ spectrum relatively sharp and well-separated bands of intraconfigurational $5f^3 \rightarrow 5f^3$ transitions were observed. The first zero-phonon lines of $5f^3 \rightarrow 5f^3$ transitions appear at about 20,000 cm^{-1} [1].

Słowa kluczowe

Uranium tribromide, U^{3+} -doped $LaBr_3$ single crystals, Vibronic transitions, Low temperature emission spectra

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