



Optical activity induced by rare-earth ions in As_2S_3 glasses and KCl crystals

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Abstract

Optical transmission spectra of As_2S_3 glass-like plates and nanolayers, undoped and doped with Sm and Pr ions have been investigated. The spectral dependences of the refractive index and glass transmission spectra, registered in the configuration of crossed polarizers, were studied. The concentration of rare-earth ions in the matrix influences on the magnitude of refractive indices (n^- , n^+) of polarized light. The emission spectra of As_2S_3 glasses, doped with rare-earth ions (Sm and Pr) and KCl crystals doped by Sm ions have been investigated for different temperatures in the range 300–10 K. A broad luminescence band associated with recombination transitions of charge carriers from $^5\text{D}_0$ levels to $^7\text{F}_{0-6}$ levels or from $^4\text{G}_{5/2}$ levels to $^6\text{H}_{5/2\dots15/2}$ levels of samarium ions (Sm^{2+} and Sm^{3+} , respectively) was registered. A number of narrow absorption bands were registered on this broad photoluminescence band, which can be attributed to self-absorption process, determined by electronic transitions between the levels ($^7\text{F}_{0-6} \rightarrow ^5\text{D}_0$ or $^6\text{H}_{5/2\dots15/2} \rightarrow ^4\text{G}_{5/2}$) of samarium ions.