

Thermal conductivity of crystals formed by fluoritelike phases in MF-RF₃ systems (M = Li, Na, and K, R = Rare Earth)

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Abstract

The temperature dependence of the thermal conductivity for laser media based on fluoride crystals was determined and its relationship with the degree of ordering in the crystal structure of these materials was found. All crystals were grown by the method of vertical directional crystallization in graphite crucibles, while 20 to 41-mm-long cylindrical samples 4–10 mm in diameter were used for measurements. The results show that the maximum value of the thermal conductivity corresponds to the LiYF₄:Nd³⁺ crystal containing only light elements. The combination in equivalent crystallographic positions of Y and Yb ions with a large difference in the ionic sizes and with an even larger difference in masses leads to pronounced phonon scattering and a lower thermal conductivity. The results obtained for NYF-type crystal correspond to the growth of thermal conductivity with temperature.

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