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Structural phase transitions in manganites $LnMnO_3$ (Ln = Ho, Er, Tm, Yb) at high temperatures

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Abstract

In the present research the investigation data are reported for ytterbium manganite with hexagonal crystal structure in the temperature interval from the room temperature up to 1200 °C with use of high-temperature X-ray diffraction and thermal analysis. In the contrary with previous studies of manganites of holmium, erbium, thulium, ytterbium up to 1200 °C, in our research the structural phase transition from $P6_3cm$ to $P6_3/mmc$ modification has not been observed. Physical-chemical properties of ytterbium manganite have been compared with previously studied manganites of holmium, erbium, thulium. It has been established that structural transition temperatures in the studied manganites depend on the ion radius of rare earth metal. At the decrease of ion radius of Ln^{3+} from 0.90 Å (for Ho^{3+}) down to 0.88 Å (for Tm^{3+}) the temperature of the transition increases from 1050 up to 1150 °C. Structural investigations for two modifications $LnMnO_3$ (Ln = Ho, Er, Tm) have been carried out – for high-temperature one with a space group $P6_3/mmc$ and for low-temperature one with a space group $P6_3cm$. Dependences of lattice cell parameters, thermal expansion coefficients and temperatures of structural phase transitions from ion radius of rare earth metal contained in $LnMnO_3$ (Ln = Ho, Er, Tm, Yb) have been established.

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