Thermal and dielectric properties of $K_3Nd(PO_4)_2$ prepared by Pechini and solid state method.

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Streszczenie

The binary neodymium–potassium phosphate β-$K_3Nd(PO_4)_2$ was obtained by the ceramic and modified Pechini methods. The obtained powders were studied using TGA/DSC, XRD, FTIR and BET techniques. The materials obtained by the Pechini method show a strong tendency towards agglomeration. The average crystallite size of β-$K_3Nd(PO_4)_2$ obtained at 480 °C amounts to about 30 nm.

The temperature and enthalpy of the β/α-$K_3Nd(PO_4)_2$ polymorphic transition were determined. In the case of the materials obtained by the Pechini method, the polymorphic transition occurs at 1181 °C and it is assisted by one endothermic effect with the $\Delta H_{ph.tr.}$ = 58 ± 9 kJ mol^{-1}. For powders obtained by ceramic technique the β/α polymorphic transition takes place in a temperature range of 1148–1180 °C and is accompanied by two endothermic effects with the total enthalpy change of 53 ± 15 kJ mol^{-1}. The effect of the synthesis method and that of the size of the phosphate crystallites on the mechanism of polymorphic transition have been discussed.

The electric permittivity and dielectric loss measurements were carried out, too. The activation energy of active dipoles in $K_3Nd(PO_4)_2$ was determined on the basis of the electric permittivity and the dielectric dispersion and absorption measurements. The activation energy amounts to 149.8 kJ mol^{-1}.

Słowa kluczowe

Rare earth alloys and compounds, Chemical synthesis, Dielectric response, Phase transitions, Thermal analysis, X-ray diffraction