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THERMO-HYDROLYSIS OF OXY-HALOGENIDE PHOSPHATE SYSTEMS OF ALKALI METALS

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Phosphate melts are commonly used like growth mediums for monocrystals, which are used in laser optics. The molten halogenides addition to phosphate melts(first of all fluorides of alkali metals) appreciably reduces the viscosity of the system and leads to solubility value changes of polyvalent metal oxides.

But at high temperatures in oxy-halogenide phosphate systems uncontrolled processes of the thermo-hydrolysis take place, as a result, the composition and properties of the system may change significantly over time. The essence of thermohydrolysis is fluoride of alkali metal and water of ambient air or end OH-groups of polymeric phosphate anions interaction at the heating of M^I_2O-P_2O_5-M^IF melts.

The purpose of this study was thermo-hydrolysis research in molten systems of M_2O-P_2O_5-MF (M = Li, Na), its influence on chemical composition and property changes of the systems research, ascertainment of the kinetic characteristics and mechanism of the process.

The calculated samples of origin components have been ground in a porcelain mortar, then they have been put in the platinum crucible in shaft-furnace at indicated temperature with access for air for this experiment. The compound fairly rapidly have been fusing, after that intensive release of HF started.

After certain intervals crucibles with melts have been removed from the furnace and selected for fluoride analysis. The crucibles have been weighed after cooling them to room temperature to register weight loss of melts.

The metaphosphates of alkali metals have been used like origin components: a) reactive preparation of $NaPO_3$ (analytic grade), b) lithium metaphosphate have been obtained from lithium carbonate and phosphate (V) acid (chemically pure). Diphosphate $Na_4P_2O_7$ has been obtained from disubstituted orthophosphate

$Na_2HPO_4 \cdot 10H_2O$ (analytic grade) by its dehydration in torch flame with the following roasting in the muffle furnace at 850°C. Lithium diphosphate has been obtained like metaphosphate: from Li_2CO_3 and H_3PO_4.

$NH_4H_2PO_4$ and $(NH_4)_2HPO_4$ (analytic grade) ammonium hydrophosphates have been used for synthesis of the phosphate systems with $M_2O/P_2O_5 < 1$ molar ratio. NaF (analytic grade), like a standard preparation of fluorides of alkali metals, has been used. LiF has been obtained from the lithium carbonate and full-strength HF.

Most intensively thermo-hydrolysis occurs in the first 15-30 minutes and holds with the participation of the end OH-groups of polymeric phosphate anions. In the sequel, for all researched systems the process ratio decreases, but doesn’t stop until completely removing fluorides from the melt, because at this stage thermo-hydrolysis occurs at the expense of water, which is absorbed by phosphatic melt from ambient air.