# Thermal Properties of $Dy_xY_{1-x}(PO_3)_3$ Phosphate Glasses at Low Temperatures

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This study is devoted to the investigation of low-temperature thermal properties of phosphate glasses $Dy_xY_{1-x}(PO_3)_3$ containing different concentrations of rare-earth $Dy^{3+}$ ions. A series of $Dy_xY_{1-x}(PO_3)_3$ samples with $Dy^{3+}$ content ($x$ = 0, 0.0001, 0.001, 0.01, 0.1, 1) were studied by means of heat capacity and thermal conductivity measurements. The heat capacity $C_p$ was measured using the relaxation technique in the temperature range from 0.4 to 20K under magnetic fields up to 9T. Thermal conductivity $\kappa(T)$ was determined by the two-probe method over a wide temperature interval from 1.8 to 300K.

The heat capacity data reveal a pronounced boson peak in the $C_p/T^3$ representation for all investigated compositions, confirming the presence of universal low-energy excitations typical for glassy systems. In $Dy^{3+}$- doped samples, an additional contribution attributed to a Schottky-type anomaly emerges, originating from the splitting of the $Dy^{3+}$ energy levels.

The temperature dependence of thermal conductivity exhibits characteristic glass-like behaviour, including a plateau observed between approximately 5 K and 20 K. At temperatures below 5 K, $\kappa(T)$ follows an approximately quadratic temperature dependence, while a gradual increase of $\kappa(T)$ is detected above 15 K. The presence of magnetic $Dy^{3+}$ ions leads to a nontrivial modification of phonon transport and affects the absolute values of thermal conductivity. These results demonstrate the significant role of magnetic scattering and phonon–spin interactions in determining heat transport in $Dy^{3+}$- doped phosphate glasses.

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