HEAT CAPACITY AND THERMODYNAMIC PROPERTIES OF COMPLEX OXIDES WITH β-PYROCHLORE STRUCTURE

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Complex metal oxides are of great interest to researchers due to their ferroelectric, catalytic, optical, ionic or electronic conductivity, and other important properties. These properties make them promising materials for use as capacitors, superconductors, semiconductors, and in piezoelectric devices. The series of compounds based on the perovskite, fluorite, pyrochlore, corundum, rutile, and other stable mineral structures are distinguished among such complex oxides. The changeable elemental composition of compounds in a series while the overall crystal structure is maintained offers a way to tailor various useful properties of the compounds.

The studied β-pyrochlore oxides are of interest in the context of this task, as their structure is stable, their composition can be varied over a wide range, and accordingly, their photocatalytic activity-associated physical properties, such as the bandgap width, can be controlled.

The heat capacity of complex oxides with β-pyrochlore structure: $CsTeMoO_6$, $CsV_{0.625}Te_{1.375}O_6$, $RbTe_{1.5}W_{0.5}O_6$, $Rb_{0.95}Nb_{1.375}Mo_{0.625}O_{5.79}$, $CsMo_{0.25}W_{1.75}O_6$, $CsSn_{0.25}W_{1.75}O_6$ was investigated by adiabatic vacuum and differential scanning calorimetry in the temperature range of T = (6 – 640) K. The standard thermodynamic functions: heat capacity, enthalpy [H°(T)−H°(0)], absolute entropy [S°(T)] and the Gibbs energy [G°(T)−H°(0)] for the range from $T \rightarrow 0$ to 640 K were calculated based on the obtained experimental data. The low-temperature (T < 50 K) heat capacity dependence was analyzed on the basis of multifractal model and chain-layered structure topology of the studied compounds was established.

The thermodynamic properties of the studied complex oxides with β-pyroclore structure were compared and analyzed.

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