

**ENTHALPIES OF FORMATION OF MIXED OXIDES IN  
ZnO-BASED TRANSPARENT CONDUCTIVE OXIDE  
SYSTEMS BY KNUDSEN EFFUSION MASS  
SPECTROMETRY**

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The evaporation thermodynamics of three quasi-binary systems of Transparent Conductive Oxides (TCOs)  $\text{Ga}_2\text{O}_3$ ,  $\text{In}_2\text{O}_3$ ,  $\text{SnO}_2$  with a common volatile component ZnO was studied by high temperature Knudsen effusion mass spectrometry.

Individual phases of mixed oxides  $\text{ZnGa}_2\text{O}_4$ ,  $\text{Zn}_7\text{In}_2\text{O}_{10}$ ,  $\text{Zn}_5\text{In}_2\text{O}_8$ ,  $\text{Zn}_2\text{SnO}_4$  as well as heterogeneous samples of the systems were investigated at the temperatures from 1360 to 1460 K. The systems exhibit the incongruent character of evaporation processes. The vapor above the systems was found to contain almost only ZnO evaporation products  $\text{Zn(g)}$  and  $\text{O}_2$  for all phase fields under consideration. From isothermal effusion experiments the vapor species partial pressures were determined and principle p-x-sections of the systems phase diagrams were constructed. Energetic characteristics of sublimation and formation of the mixed oxides including the standard enthalpies of formation were obtained by the third-law calculations.

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