Oscillation Method of Phase Analysis

A.B. Kaplun[C] and A.B. Meshalkin[S]
Institute of Thermophysics, Siberian Division of the Russian Academy of Sciences, Novosibirsk, Russia
kaplun@itp.nsc.ru

The oscillation methods of phase analysis were developed in the Institute of Thermophysics SB RAS and are used for complex studies of properties and phase equilibria in metals and oxide-salt systems.

The principle of oscillation method of phase analysis (OPA) is based on effect that resistance to fluid flow rises sharply and the amplitude of the probe oscillation decreases when the crystals appear in the liquid and on the probe surface in the course of cooling. When the crystals are dissolved as the temperature of the sample increases, the resistance to the fluid flow decreases and the amplitude of oscillation increases. When the crystals are totally dissolved, the amplitude of the probe oscillations is equal to that obtained before crystallization at the same temperature unless the liquation occurs during crystallization and melting. The detection sensitivity of solid phase presence is surpassing thermal methods sensitivity in 100-1000 times. OPA method permits measurements both in dynamic and in static conditions that gives possibility close to system equilibrium. Accuracy of liquidus temperature determination in high viscosity oxide systems is surpassing other well-known methods in tenth times.

The oscillation method of phase analysis is allow to determinate in one experiment in addition to liquidus temperature and melt viscosity more then 10 parameters of crystallization and melting, it is including: measurement of the onset crystallization and melting end temperature in depending from heating and cooling sample rates, liquation effects study, character (type) of solidification and melting determination, time for reach of steady state in crystallization and melting processes estimation, take a sample of crystallized phases and etc.

Complex systematic investigation of phase equilibria and physical characteristics in metallic and oxide binary and ternary systems are carrying out with methods designed by us. And in well-investigated alkali-borate systems we found few new compounds. And some compounds were found in other oxide systems.