

Thermophysical Property Measurements of FeCo Alloys

J. Lee

Tufts University, Medford, MA, U.S.A.

R.W. Hyers

University of Massachusetts, Amherst, MA, U.S.A.

D.M. Matson^{C, S}

Tufts University, Medford, MA, U.S.A.

Douglas.Matson@tufts.edu

Convection velocity during solidification has become of primary interest in the study of phase selection of metallic alloys. For a number of reasons, the investigation of internal flow in molten alloys must depend on computational techniques. The convection inside the levitated droplet is governed by the Navier-Stokes equations and the fluid flow is characterized by the Reynolds number. Therefore it is critical to attain the density and viscosity of the fluid with reasonable accuracy. In this research thermophysical properties of iron-cobalt alloys in various compositions are measured using electrostatic levitation facilities at NASA Marshall Flight Space Center in Huntsville, AL. After a spherical sample is levitated and melted, the projected area of the sample is captured with a high speed camera. Density is calculated by dividing its mass with the volume estimated from the projected area using novel machine vision systems in described in previous research. For measurements of viscosity and surface tension the sample is excited by an alternating electrostatic field at frequencies near the natural frequency of the sample, and then it is allowed to dampen freely. From the decay time and dampening frequency the viscosity and surface tension are derived.