

Measurement of the Surface Tension and Viscosity of Ti-Al and Ni-Al alloys by the Oscillating Drop Technique on Board Parabolic Flights

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The surface tension and the viscosity of a series of industrial Ni- and Ti-alloys were measured by the oscillating drop method with an electromagnetic levitation device on board parabolic flights. Parabolic flights provide about 20 seconds of reduced gravity which are sufficient to heat, melt, process in the liquid phase and cool a 6 to 7 mm diameter specimen to solidification. In the free cooling phase with the heating field turned off, magnetic field pulses for the excitation of surface oscillations are applied. Because of the much reduced positioning forces under micro-g conditions, turbulent fluid flow is absent or strongly reduced, which is a necessary condition for the evaluation of the viscosity from the damping time constant of the surface oscillations. This method is particularly suited for high temperature reactive alloys where container reactions will affect the results obtained with conventional methods such as the sessile drop or rotating cup method for surface tension and viscosity measurements, respectively. The measurement method and data analysis will be discussed. Results for the viscosity and surface tension of γ -TiAl, Ti6Al4V and Ni-Al alloys will be presented. The experiments were performed within the framework of the ThermoLab project which is concerned with the measurement of the thermophysical properties of industrial alloys in the liquid phase.