

MICROGRAVITY SCIENCES AND PROCESSES (A2)
Science Results from Ground Based Research (4)

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THE THERMOLAB PROJECT: THERMOPHYSICAL PROPERTY MEASUREMENTS IN AN
ELECTROMAGNETIC LEVITATION DEVICE UNDER REDUCED GRAVITY CONDITIONS**Abstract**

Long duration microgravity experiments as provided on the International Space Station, ISS, or on sounding rocket flights offer the possibility for detailed investigations of ThermoPhysical properties of metals in the stable or undercooled liquid phase. Containerless processing conditions are required for such investigations. First, because many alloys of interest are chemically reactive in the liquid phase and second, to make the undercooled liquid state accessible to thermophysical investigations. As such, the motivation for such experiments on liquid metals is twofold. Thermophysical properties of industrial alloys in the liquid phase are needed for the modelling of casting and solidification and, in general a better understanding of alloy properties. Investigations of the undercooled liquid phase address more basic metal physical questions such as the correlation between macroscopic fluid properties such as the viscosity and structural properties of the melt. A detailed understanding of this relation would allow first principles modelling of the viscosity and other alloy properties which eventually could be applied to alloys of industrial interest. The method of choice for these investigations is containerless processing in an electromagnetic levitation device. Electromagnetic levitation is an established method and has been used for thermophysical property measurement on board parabolic flights on TEXUS sounding rockets and on board of two Spacelab missions. Experimental techniques have been continuously refined such that all basic thermophysical properties in the liquid phase required for casting and solidification modelling can be measured. In addition, the facility allows investigation of solidification kinetics. An electromagnetic levitation facility is currently being built for installation on the ISS. In order to fully exploit the capabilities of this facility an international investigator group has been formed called 'ThermoLab on ISS'. An overview of the project, planned experiments on ISS and experimental results obtained on short and intermediate duration micro gravity platforms are presented.