

TEMP

Analysis of Cylindrical Multi-Probes for Determination of Thermal Properties in Extreme Environments

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Keywords			

Projektbeschreibung

When thermo-physical parameters of materials are to be determined in extreme environments, ruggedized sensors are used. Such environments may occur in certain field measurements or on the surfaces of extra-terrestrial bodies like the Moon, the terrestrial planets, asteroids or comets. It is a special challenge to measure thermal properties of bodies of the solar system in the framework of space missions. In such an undertaking one has to make sure that the probes are sufficiently robust and capable to yield accurate results in often adverse conditions. For the measurement of thermal properties, which are represented by thermal conductivity and heat capacity, cylindrical probes emerged as very suitable for such environments.

Although cylindrical probes were used for decades, there are still open questions about various error sources, as was repeatedly addressed in the recent research literature. Especially for the future application in extreme environments like vacuum (Moon, asteroids) or low pressure atmospheres (Mars, comets) the study of these unsolved problems is indispensable. This project is dedicated to the investigation of the most important items, namely the influence of surface resistances at probe/sample interfaces, the parasitic heat drain through measurement leads, and the optimum geometries of multi-probe arrangements. Furthermore, in this project single as well as multi-probes (consisting of two or more cylindrical probes) will be studied. These investigations will show which arrangements and which heating modes are best suited for accurate determination of thermal conductivity and heat capacity of the sample material. It will also be analysed if the simultaneous measurement of the temperatures in several probes enables one to determine further unknown parameters. Examples are the probe/sample surface resistance and the parasitic heat drain, which are error sources in the usual measurements based on a temperature curve of a single probe.

The outcome of this project will considerably contribute to the understanding of the principles of thermo-physical measurements under the mentioned extreme conditions, and thus enhance the existing expertise in the Space Research Institute. The publication of the results will strengthen Austria's position in the international space research network, but also in the geo- and soil science community.

Projektpartner

- Österreichische Akademie der Wissenschaften Institut für Weltraumforschung (IWF)