Geophysical Research Abstracts
Vol. 16, EGU2014-7834, 2014
EGU General Assembly 2014

Development of Standard Samples for on-board Calibration of a New Planetary X-Ray Fluorescence Spectrometer

Anne Dreißigacker (1), Eberhard Köhler (1,2), Oliver Fabel (1), and Stephan van Gasselt (1)

(1) Freie Universität Berlin, Institue of Geological Sciences/ Planetary Sciences, Department of Earth Sciences, Berlin, Germany (a30acker@zedat.fu-berlin.de), (2) EKTECH GmbH, Berlin

At the Planetary Sciences and Remote Sensing research group at Freie Universität Berlin an SCD-based X-Ray Fluorescence Spectrometer is being developed to be employed on planetary orbiters to conduct direct, passive energy-dispersive x-ray fluorescence measurements of planetary surfaces through measuring the emitted X-Ray fluorescence induced by solar x-rays and high energy particles.

Because the Sun is a highly variable radiation source, the intensity of solar X-Ray radiation has to be monitored constantly to allow for comparison and signal calibration of X-Ray radiation from lunar surface materials. Measurements are obtained by indirectly monitoring incident solar x-rays emitted from a calibration sample. This has the additional advantage of minimizing the risk of detector overload and damage during extreme solar events such as high-energy solar flares and particle storms as only the sample targets receive the higher radiation load directly (while the monitor is never directly pointing towards the Sun).

Quantitative data are being obtained and can be subsequently analysed through synchronous measurement of fluorescence of the Moon's surface by the XRF-S main instrument and the emitted x-ray fluorescence of calibration samples by the XRF-S-ISM (Indirect Solar Monitor).

We are currently developing requirements for 3 sample tiles for onboard correction and calibration of XRF-S, each with an area of 3-9 cm^2 and a maximum weight of 45 g. This includes development of design concepts, determination of techniques for sample manufacturing, manufacturing and testing of prototypes and statistical analysis of measurement characteristics and quantification of error sources for the advanced prototypes and final samples.

Apart from using natural rock samples as calibration sample, we are currently investigating techniques for sample manufacturing including laser sintering of rock-glass on metals, SiO_2-stabilized mineral-powders, or artificial volcanic glass.

High precision measurements of the chemical composition of the final samples (EPMA, various energy-dispersive XRF) will serve as calibration standard for XRF-S.

Development is funded by the German Aerospace Agency under grant 50 JR 1303.