INNOVATIONS IN EDS AND EBSD MICROANALYSIS: HYPERSPECTRAL IMAGING FOR PLANETOLOGICAL APPLICATIONS USING SILICON DRIFT DETECTORS (SDD) AND EBSD. T Salge1 and G. Nolze1. 1Bruker AXS Microanalysis GmbH, Schwarzschildstr. 12, 12489 Berlin, Germany. E-mail: tobias.salge@bruker-axs.de.

Within the last decade, silicon drift detectors (SDD) systems have become more and more popular in the field of energy-dispersive spectroscopy (EDS). The main characteristic of the SDDs is their extremely high pulse load capacity of up to 750,000 counts per second at good or reasonable energy resolution (<123 eV Mn-Kα, <46 eV C-Kα at 100,000 cps). These properties in conjunction with electron backscatter diffraction (EBSD) techniques and modern data processing make a range of innovative analysis options possible, not only high speed mapping but also hyperspectral imaging techniques.

Ultra-fast element mappings in the megapixel range can be performed up to 10 times faster compared to conventional Si(Li) detectors. HyperMap (PTS: position tagged spectroscopy) creates a database that contains an EDS spectrum for each pixel in addition to the image. This supports offline evaluation and quantification of regions of interest (point and area analyses, line scans) any time after the mapping acquisition. The Maximum Pixel Spectrum function [1] synthesizes a spectrum out of the Hypermap data, consisting of the highest count level found in each spectrum channel. Here, trace elements which occur in only one pixel can be detected qualitatively. Areas of similar composition can easily be made visible with Autophase, an automatic (based on principal components analysis) or user-controlled, spectroscopic phase detection system.

This paper presents planetological applications with the QUANTAX EDS system including SDD and EBSD using the options described above: (1) Fast detection and discrimination of minerals within impact-induced accretionary lapilli [2]. (2) Drill core analysis of a Chicxulub ejecta sequence from the K/T boundary at ODP leg 207 [3] using fast, high resolution (4096x3072 pixel) element maps. (3) Spectroscopic phase analysis of a sulfate-carbonate-dominated impact matrix at borehole UNAM-7 from the Chicxulub impact crater [2]. (4) Automated baddeleyite search within lunar meteorite Dhofar 287 [4]. (5) EBSD studies with examples of iron meteorites and impact-induced, recrystallized carbonate melts [2].


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