Compositional analysis of interstellar dust as seen by the Cassini Cosmic Dust Analyzer.

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The goal of this work is to evaluate constraints on the composition of interstellar dust (ISD) grains, obtained via impact ionization time-of-flight mass spectroscopy with the Cosmic Dust Analyzer (CDA) onboard the Cassini spacecraft at Saturn.

Method: 13 ISD candidates have been extracted from the vast Cassini CDA data set, based on the evaluation of their dynamical properties. To derive chemical composition from time-of-flight mass spectra of high energy particle impacts, we calibtrated the laboratory unit of the CDA[1], and the high resolution Large Area Mass Analyzer (LAMA)[2] with a specifically manufactured orthopyroxene dust analogue. For particle impact simulations we utilized a 2MV Van de Graaff accelerator at Heidelberg [3]. The dust analogue material was analysed by geochemical standard techniques (scanning electron microscope - SEM; electron microprobe analysis - EMPA), and ground to sub-micron size and coated with a conductive Pt-layer for the acceleration through an electromagnetic field[4].

Results: i) We inferred sensitivity coefficients for impact ionization TOF mass spectra, so that ii) mass spectra from the CDA and LAMA could be compared with with typical compositions of terrestrial and cosmochemically relevant silicate minerals, and bulk compositions. iii) The suite of ISD canditates can be clearly divided into a Fe-rich fraction and a Mg-rich fraction. iv) Comparing the ISD candidate compositions to cosmochemically relevant reservoirs, it can be shown that many Mg-dominated ISD candidate data plot close to a solar or cosmic composition (CI), possibly slightly volatile depleted. If the Fe-rich ISD candidates are more similar to metal or Fe-rich silicates, has to await more detailed analyses.

References:[1]R. Srama, et al., *The Cassini Cosmic Dust Analyzer*. Space Sci. Rev., **114**: 465–518 (2004). [2] R. Srama, et al*., Laboratory Tests of the Large Area Mass Analyser*. Dust in Planetary Systems, **643**:209–212 (2007)**.** [3]A. Mocker, et al., *A 2mv van de graaff accelerator as a tool for planetary and impact physics research*. Rev. Sci. Instr. (2011), [4] J. K. Hillier, et al., The *production of platinum-coated silicate nanoparticle aggregates for use in hypervelocity impact experiments*. Planet. Space Sci. (2009).