DUST FROM COLLISIONS IN CIRCUMSTELLAR DISKS: SIMILARITIES TO METEORITIC MATERIALS ?

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Introduction: There is growing evidence from astronomical observations that dust is produced in later stages of circumstellar disks by collisions of larger bodies or planetesimals [e.g. 1,2]. The bodies involved probably have similar characteristics like the planetesimals in our own young Solar System. In the form of meteorites we have remnants of these bodies available for measurements. For the interpretation of astronomical infrared spectra of dust, a comparison with infrared spectra of material from such meteorites should be useful.

Samples and Techniques: Material form matrix and CAI was separated from polished samples, powdered to a sub-micron powder and measured using a Perkin Elmer AutoImage FTIR microscope [e.g. 3]. For chondrules and bulk measurements of achondrites and martian samples, infrared spectra were obtained from KBr pellets using the Perkin Elmer Spectrum One workbench [e.g. 4]. For the comparisons and calculations here, all transmission/absorption spectra were calculated to a spectral resolution of $4cm^{-1}$ in the range from 8 to 16 μm.

Discussion: If the population of planetesimals collided in the observed circumstellar discs is a diverse as in our own solar system, the astronomical infrared spectra show probably a mixture of many types of sources, both primitive and differentiated. Thus also mixtures of laboratory meteorite spectra were calculated and compared with typical astronomical spectra of circumstellar disks, where accretion (and thus collisions) possibly already took place. First preliminary results are presented below.

Single Meteorite Samples: Matrix material from Kakangari (K3) has very similar band positions to HD179218 (~1.25My [5]) and Hen3-600 (1-10My [5]), although with different relative band intensities. Material from bulk Ureilites (Hajmah-A) is similar to that of HD100546 (>10My [5]) [4].

Meteorite Mixtures: Spectra like that of Herbig stars HD142527 (~1My [5]) and HD104237 (~2 My [5]) can be reproduced with a 1:2 mixture of olivine rich matrix from a CO chondrite (Ornans) and tektite (representing impact melt glasses). A 3:3:5 mixture of Ureilites, chondrules and tektite also shows a good similarity, like a 1:2 mixture of Kakangari matrix and olivine-rich chondrules.

The spectra of Herbig star HD163296 (~5My [5]) has similarity to a 1:2:1.5 mixture of CI1 (Alais) matrix, olivine-rich chondrules and HED bulk material. Also a mixture of chondrule material and tektites gives good results.

Some results make more sense in an early Solar System environment than others. This will be discussed in the presentation

References: [1] Telesco et al. (2005) *Nature, 433*, 133-136. [2] Okamoto et al. (2004) *Nature, 431,* 660-663. [3] Morlok et al. (2005) 36th Lunar & Planetary Science Conference Abstract # 1644 [4] Morlok et al. (2006) 37th Lunar & Planetary Science Conference Abstract #1519 [5] van Boekel et al (2005) *A&A, 437*, 189-208 189-208.