CARBON RAMAN SPECTROSCOPY OF 36 INTERPLANETARY DUST PARTICLES. H. Busemann[1,2], L. R. Nittler[2], J. Davidson[3], I. A. Franchi[3], S. Messenger[4], K. Nakamura-Messenger[4], R. L. Palma[5,6], and R. O. Pepin[6], [1]SEAES, Univ. of Manchester, UK. E-mail: busemann@manchester.ac.uk. [2]DTM, Carnegie Inst. of Washington, USA. [3]PSSRI, Open Univ., UK. [4]NASA/JSC Houston, USA. [5]Physics & Astron., Minnesota State Univ., Mankato, USA. [6]Physics & Astron., Univ. of Minnesota, Minneapolis, USA.

Introduction: Carbon Raman spectroscopy is a useful tool to determine the degree of order of organic material (OM) in extraterrestrial matter [1, 2]. As shown for meteoritic OM [e.g., 2], peak parameters of D and G bands are a measure of thermal alteration, causing graphitization (order), and amorphization, e.g. during protoplanetary irradiation, causing disorder [2, 3].

The most pristine interplanetary dust particles (IDPs) may come from comets. However, their exact provenance is unknown. IDP collection during Earth's passage through comet Grigg-Skjellerup's dust stream ("GSC" collectors) may increase the probability of collecting fresh IDPs from a known, cometary source [4]. We used Raman spectroscopy to compare 21 GSC-IDPs with 15 IDPs collected at different periods, and found that the variation among GSC-IDPs is larger than among non-GSC IDPs, with the most primitive IDPs being mostly GSC-IDPs.

Results: All IDPs were analyzed with Raman spectrometers at Carnegie and PSSRI [2, 5]. 23 IDPs contained detectable OM. Their data follow the trends for meteoritic and Stardust OM [2, 5]. The IDP-OM is similar to or more primitive than the most primitive chondritic OM. The variation among GSC-IDPs is much larger than among non-GSC IDPs. 6 of the 7 most primitive IDPs in the G band- and 6 of 10 in the D band parameter space, respectively, are GSC-IDPs. However, average C Raman parameters for GSC- and non-GSC-IDPs are indistinguishable. 9 GSC-IDPs were analyzed in silicone oil; others were analyzed before and after pressing into gold (for subsequent SIMS analysis). Neither treatment affected the Raman results. While Cs^+ irradiation during SIMS analysis can produce amorphization [2], we did not observe a systematic shift of the Raman parameters of the 7 IDPs that had previously been analyzed by SIMS.

Discussion: Many GSC-IDP observations such as extreme presolar silicate abundances [6], OM with large D and ^{15}N isotopic anomalies (IDPs L2054 E1, G4 [6]), huge C abundance [7], a new mineral (L2055 I3 [7]), and the lack of abundant noble gases and irradiation records [7, 8] suggest that some GSC-IDPs may indeed originate freshly from comet Grigg-Skjellerup [4]. This is supported by the very primitive Raman parameters for the IDPs L2054 E1, G4 and L2055 I3. Similar average Raman parameters for GSC- and non-GSC-IDPs indicate that both collections otherwise sample the same, well-mixed dust reservoir from various sources that were mostly un-affected by significant parent body thermal processing as recorded in meteoritic OM.

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