ORGANIC RIMS ON INDIVIDUAL GRAINS IN CP IDPS: CONSTRAINTS ON THE ORIGIN OF PRE-BIOTIC ORGANIC MATTER. G. J. Flynn[1], S. Wirick[2], L. P. Keller[3], C. Jacobsen[2], and S. A. Sandford[4]. [1]Dept. of Physics, SUNY-Plattsburgh, Plattsburgh NY 12901 USA (george.Flynn@plattsburgh.edu). [2]Dept. of Physics and Astronomy, SUNY- Stony Brook, Stony Brook, NY 11794 USA, [3]NASA Johnson Space Center, Houston TX 77058 USA, [4]NASA Ames Research Center, Moffett Field, CA 94035 USA.

Introduction: Chondritic, porous interplanetary dust particles (CP IDPs) are the most primitive samples of extraterrestrial material available for laboratory analysis [1]. These ~10 μm CP IDPs are unequilibrated aggregates of mostly submicron, anhydrous grains of a diverse variety, including olivine, pyroxene, glass, and sulfide. We previously reported that CP IDPs contain a significant amount of organic matter, and concluded that parent body aqueous processing, which these IDPs never experienced, was not the mechanism that produced much of the pre-biotic organic matter of the early Solar System [2]. However, we were not able to establish either the time or mechanism of its production.

Measurements: The individual grains in these CP IDPs are coated by layers of carbonaceous material [3], typically ~100 nm thick, which holds the grains together. We have analyzed these grain coatings by X-ray Absorption Near-Edge Structure (XANES) spectroscopy using the Scanning Transmission X-Ray Microscope (STXM) on beamline X1A of the National Synchrotron Light Source. We have obtained C-XANES maps, using a 35 nm probe spot, of ultramicrotome sections from nine CP IDPs. Cluster analysis, which compares spectra from each pixel in the map and identifies groups of pixels exhibiting similar spectra [4] was used to analyze the data. When applied to a CP IDP, cluster analysis indicates most of the carbonaceous grain coatings have very similar C-XANES spectra. These C-XANES analyses demonstrate that carbonaceous coatings on the individual grains in CP IDPs are organic, with the two strongest absorption features from C=C and C=O. This organic matter coats the individual grains, implying an assembly sequence beginning with grain formation, followed by the emplacement of the organic coating, and finally the assembly of the primitive dust particles.

Conclusions: The organic grain coatings in the primitive CP IDPs appear to have formed prior to the aggregation of the most primitive dust particles currently available for laboratory analysis, indicating that these grain coatings are the oldest surviving samples of the pre-biotic organic matter in our Solar System. The thickness and C-XANES spectrum for the coatings on all grains in an individual CP IDP are very similar, independent of the mineralogy of the underlying grain. This indicates that mineral specific catalysis (e.g., the Fischer-Tropsch process), one of the widely accepted models for organic formation in the early Solar System, was not the production mechanism for the primitive, pre-biotic organic matter that coats the grains in the CP IDPs. Our observations are consistent with the alternative model, that primitive organic matter was produced by irradiation of carbon-bearing ices that condensed on the grain surfaces.

References: [1] Ishii, H. A. et al (2008) *Science* **319**, 447-450. [2] Flynn, G. J. et al. (2003) *Geochim. Cosmochim. Acta* **67**, 4791-4806. [3] Thomas, K. L. et al. (1996) in *Physics, Chemistry and Dynamics of Interplanetary Dust*, ASP Conf. Series, 104, 283286. [4] Lerotic, M (2005) *Journal of Electron Spectroscopy and Related Phenomena*, **144-147**, 1137-1143.