EXPERIMENTAL INSIGHTS INTO THE FORMATION OF INTERSTELLAR FULLERENES AND CARBON NANOTUBES

JACOB BERNAL[a], *Department of Chemistry and Biochemistry, University of Arizona, Tucson, AZ, USA*; THOMAS J. ZEGA, *Department of Planetary Science, Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ, USA*; LUCY M. ZIURYS, *Dept. of Astronomy, Dept. of Chemistry, Arizona Radio Observatory, The University of Arizona, Tucson, AZ, USA*.

The detection of the fullerenes C_{60} and C_{70} in the interstellar medium (ISM) has transformed our understanding of chemical complexity in space, and have also raised the possibility for the presence of even larger molecules in astrophysical environments. Here we report in situ heating of analog silicon carbide (SiC) presolar grains using transmission electron microscopy (TEM). These heating experiments are designed to simulate shocks occurring in post-AGB stellar envelopes. Our experimental findings reveal that heating the analog SiC grains yields hemispherical C_{60}-sized nanostructures, which later transform into multi-walled carbon nanotubes (MWCNTs). These MWCNTs are larger than any of the currently-observed interstellar fullerene species, both in overall size and number of C atoms. These experimental results suggest that such MWCNTs are likely to form in post-AGB shocks, where the structures, along with the smaller fullerenes, are subsequently injected into the ISM.

[a]Current Affiliation: University of Arizona Department of Planetary Science, Lunar and Planetary Laboratory