Synthesis and Spectroscopy of Large Carbon Molecules with Ames' COSmIC Facility in Support of NASA's Space Missions

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We present and discuss the unique characteristics and capabilities of the laboratory facility, COSmIC, that was developed at NASA Ames to generate, process and analyze interstellar and planetary analogs in the laboratory. COSmIC stands for Cosmic Simulation Chamber and is dedicated to the study of molecules and ions under the low temperature and high vacuum conditions that are required to simulate interstellar, circumstellar and planetary physical environments in space. COSmIC integrates a variety of state-of-the-art instruments that allow forming, processing and monitoring simulated space conditions for planetary, circumstellar and interstellar materials in the laboratory. COSmIC is composed of a Pulsed Discharge Nozzle (PDN) expansion that generates a free jet supersonic expansion coupled to two ultrahigh-sensitivity, complementary in situ diagnostics: a Cavity Ring Down Spectroscopy (CRDS) system for photonic detection and a Reflectron Time-Of-Flight Mass Spectrometer (ReTOF-MS) for mass detection. Recent, unique, laboratory astrophysics results that were obtained using the capabilities of COSmIC will be discussed, in particular the progress that have been achieved in monitoring in the laboratory the formation of solid gains from their gas-phase molecular precursors in environments as varied as stellar/circumstellar outflow and planetary atmospheres. Plans for future, next generation, laboratory experiments on cosmic molecules and grains in the growing field of laboratory astrophysics will also be addressed.

References:

NASA's "COSmIC" Simulator Helps Fingerprint Unknown Matter in Space, In NASA Technologies; http://www.nasa.gov/topics/technology/features/tofs_prt.htm

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