NASA Ames' COSmIC Laboratory Astrophysics Facility: Recent Results and Progress

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The COSmIC facility was developed at NASA Ames to study interstellar, circumstellar and planetary analogs in the laboratory [1, 2]. COSmIC stands for "Cosmic Simulation Chamber" and is dedicated to the study of neutral and ionized molecules and nanoparticles under the low temperature and high vacuum conditions that are required to simulate space environments. COSmIC integrates a variety of instruments that allow generating; processing and monitoring simulated space conditions in the laboratory. It is composed of a Pulsed Discharge Nozzle (PDN) expansion that generates a plasma in a free supersonic jet expansion coupled to high-sensitivity, complementary in situ diagnostic tools, used for the detection and characterization of the species present in the expansion: a Cavity Ring Down Spectroscopy (CRDS) and fluorescence spectroscopy systems for photonic detection, and a Reflectron Time-Of-Flight Mass Spectrometer (ReTOF-MS) for mass detection [3, 4].

Recent advances achieved in laboratory astrophysics using COSmIC will be presented, in particular in the domain of the diffuse interstellar bands (DIBs) [4, 5] and the monitoring, in the laboratory, of the formation of dust grains and aerosols from their gas-phase molecular precursors in environments as varied as circumstellar outflows [6] and planetary atmospheres [7, 8, 9]. Plans for future laboratory experiments on cosmic molecules and grains in the growing field of laboratory astrophysics (NIR-MIR CRDS, Laser Induced Fluorescence spectra of cosmic molecule analogs and the laser induced incandescence spectra of cosmic grain analogs) will also be addressed as well as the implications of the on-going studies for astronomy.

References:

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Acknowledgements: The authors acknowledge the support of NASA SMD/APRA and SSW programs.