

Laboratory Astrophysics at NASA Ames: Recent Results and Advances

Farid Salama¹, Ella Sciamma-O'Brien¹, Salma Bejaoui^{1,2}, Lisseth Gavilan^{1,3} and David Dubois^{1,2}

¹NASA Ames Research Center, Moffett Field, CA, ²Bay Area Environmental Research Institute, Moffett Field, CA, NPP/USRA

The Cosmic SIMulation Chamber (COSmIC) facility was developed at NASA Ames to study, in the laboratory, neutral and ionized molecules and nanoparticles under the low temperature and high vacuum conditions representative of interstellar, circumstellar and planetary environments [1]. COSmIC is composed of a Pulsed Discharge Nozzle 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 and fluorescence spectroscopy systems operating in the UV-Visible range [2], and a Reflectron Time-Of-Flight Mass Spectrometer (ReTOF-MS) [3]. We will present recent advances that were achieved in laboratory astrophysics using COSmIC. These include advances in the domain of the diffuse interstellar bands (DIBs) [4, 5] and in 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]. An extension of the spectral response of the facility into the infrared (IR) range is in progress with the addition of a high-resolution near-IR to mid-IR CRDS system that will allow to further investigate cosmic molecules and grains with COSmIC. Acquisition of laser induced fluorescence spectra of cosmic molecule analogs and the laser induced incandescence spectra of cosmic grain analogs are also planned. Preliminary results in these fronts will be presented and the implications of the on-going studies for astronomy will be addressed.

References:

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