FOURIER TRANSFORM INCOHERENT BROADBAND CAVITY ENHANCED ABSORPTION SPECTROSCOPY DEVELOPED FOR THE STUDY OF COLD ASTROPHYSICAL ANIONS IN A PLANAR LAVAL NOZZLE EXPANSION

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The molecular diversity of cold interstellar medium has been recently enriched with the detection of molecular anions: C_4H^-, C_6H^-, C_8H^-, C_3N^-, C_5N^- and CN^-. Although by far less abundant than neutrals, anions could play a significant role in the chemistry of molecular clouds[a,b]. With the exception of C_5N^-, whose identification in space was based on high-level ab initio calculations[c], the astronomical detection of these anions was made possible thanks to the laboratory characterization of their rotational spectra. Our ultimate goal is to characterize the anionic carbon chains C_x^- (x = 3, 4, 5,...) through their electronic spectra in order to explain the absorption features already observed one century ago in some diffuse interstellar clouds illuminated by reddened stars. We will represent our new instrument based on a planar de Laval supersonic plasma source coupled to Incoherent Broadband Cavity-Enhanced Absorption Spectroscopy (IBB-CEAS) in conjunction with a high-resolution Fourier transform spectrometer for the detection. Preliminary results obtained on neutral species (O_2, CH_4, C_2H_2) will be presented.

[a] A. Van Orden, R.J. Saykally, Chem. Rev. 98 (1998) 2313-2358

[b] W. Weltner Jr, R.J. Van Zee, Chem. Rev. 89 (1989) 1713-1747

[c] J. Cernicharo et al. The Astrophysical Journal 688, no 22008: L83 86