Laboratory Anion Chemistry: Implications for the DIBs, and a Potential Formation Mechanism for a Known Interstellar Neutral Molecule

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Due to recent interest in molecular anions as possible interstellar species, we have carried out several laboratory studies of anion chemistry. The reactions of the series C_m^- and C_mH^- with H and H_2 were studied to address the viability of such species in the diffuse interstellar medium and to address their ability to be carriers of the DIBs. These same molecules were also reacted with N and O to find possible heteroatomic products. C_mN^- was a particularly stable product from the reaction of C_m^- + N. C_3N^- was further reacted with H to study chemistry that could produce HC_3N, a known interstellar species. The reactions were done in a flowing afterglow selected ion flow tube apparatus (FA-SIFT). The anions were generated in an electron impact or cold cathode discharge source and the anion of interest was then selected by a quadrupole mass filter. The selected ion was then reacted with the atomic or molecular species in the flow tube and products were detected by another quadrupole. While the C_m^- species do not appear to be viable DIB carriers, their possible presence could provide a mechanism for the formation of known heteratomic neutral molecules detected in the ISM.