Synthesis of ethane in ion-irradiated water ice mixtures with organics relevant to comets

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During the recent apparitions of Comets C/1996 B2 Hyakutake and C/1995 O1 Hale-Bopp, abundant ethane, methane, and acetylene were detected. To investigate the possibility of condensed-phase synthesis of C_2H_6 in interstellar ices due to radiation processing, we have examined the role of CH_4 and C_2H_2 in the synthesis of C_2H_6 in laboratory-formed low-temperature ices (Hudson and Moore, 1997; Moore and Hudson, 1998). Water dominated icy mixtures containing CH_4 and/or C_2H_2 were bombarded with MeV protons. Results showed that yields of C_2H_6 from CH_4 due to dimerization reactions were similar to yields of C_2H_6 from H atom addition reactions with C_2H_2. In water dominated mixtures, CH_4 was not a source of C_2H_2, suggesting that C_2H_2 is part of the natal chemistry of these comets. Other new products were CH_3OH, C_2H_5OH, CO, CO_2, HCO, H_2CO, and CH_3CHO.

References:

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