FORMATION OF CH^+: SHOCK CHEMISTRY IN NGC 7027

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The formation of CH^+ in the interstellar medium has been an enigma for the past 70 years. Emission from the species is found in diffuse material, even though the major pathway leading to the species, C^+ + H_2, is endothermic by 0.40 eV. The barrier for this reaction can be greatly reduced if the H_2 is vibrationally excited. Using the Heterodyne Instrument for the Far Infrared (HIFI) on board the Herschel Space Observatory, we have mapped CH^+ $(J = 1 \rightarrow 0)$, CH^+ $(J = 2 \rightarrow 1)$, and C^+ $(J = 3/2 \rightarrow 1/2)$ across the face of the young planetary nebula, NGC 7027. Analysis of the spectra has shown that CH^+, C^+, and vibrationally excited H_2 apparently trace the same outflow in NGC 7027. Therefore CH^+ in this nebula likely forms from the activated C^+ + H_2 reaction. Spectral maps, temperatures, and abundances of CH^+ will be presented along with spectral maps of C^+.