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Prebiotic hydrocarbon synthesis in impacting reduced astrophysical icy mixtures[1] NIR GOLDMAN, LUCAS KOZIOL, Lawrence Livermore Natl Lab — We present results of prebiotic organic synthesis in shock compressed reducing mixtures of simple ices from quantum molecular dynamics simulations extended to close to chemical equilibrium time-scales. Given the relative abundance of carbon in reduced forms in astrophysical ices as well as the tendency of these mixtures to form complex hydrocarbons under the presence of external stimuli, it is possible that cometary impact on a planetary surface could have yielded a larger array of prebiotic organic compounds than previously investigated. We find that the high pressures and temperatures due to shock compression yield a large assortment of carbon and nitrogen bonded extended structures that are highly reactive with short molecular lifetimes. Expansion and cooling causes these materials to break apart and form a wide variety of stable, potentially life-building compounds, including long-chain linear and branched hydrocarbons, large heterocyclic compounds, and a variety of different amines and exotic amino acids. Our results help provide a bottom-up understanding for hydrocarbon impact synthesis on early Earth and its role in producing life building molecules from simple starting materials.

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