A NEW INTERSTELLAR MODEL FOR HIGH-TEMPERATURE TIME-DEPENDENT KINETICS

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We have developed a kinetic approach to investigate time-dependent, high-temperature interstellar chemistry that can occur up to 1000 K. The network used is an expanded OSU gas-phase network, which includes both exothermic processes with barriers and endothermic reactions. The rates of reactions between ions and polar neutral species were modified to have less temperature dependence at high temperature. Our calculations show that H_2O and NH_3 are more abundant forms of oxygen and nitrogen than atomic oxygen, atomic nitrogen, and N_2, which are dominant in cold clouds. Methane became more abundant in the high-temperature model than in the cold cloud model while CO is still the dominant form of carbon. Higher abundances of H_2O and CH_4 are also obtained by a thermodynamic model (Markwick et al) although it does not produce the variety of molecules that have been observed in high-temperature sources. When an appropriate cosmic-ray induced ionization or X-ray ionization is incorporated, this expanded network can be applied to dynamic models such as those needed for active galactic nuclei, which will be observed in some detail when ALMA becomes fully operational.