Branched Chain Molecules in Interstellar Medium

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Interstellar detection of the straight-chain (n-propyl cyanide, n−C_3H_7CN) and branched-chain (i-propyl cyanide, i−C_3H_7CN) molecules toward the star-forming region, Sgr B2(N2) has attracted attention to study the formation mechanism and chemical evolution of branched carbon-chain molecules. These moleules are the precursors of biologically relevant prebiotic molecules, i.e., amino acids. In this light, we consider n-butyl cyanide and higher-order branched chain molecule, t-butyl cyanide from the C_5H_9N isomeric group. We employ gas-grain chemical model to study the chemical evolution of these species. We predict new formation and destruction pathways which could lead to more insight into the formation and destruction schemes of complex organic branched chain molecules in space. Quantum chemical calculations such as binding energy, enthalpy of formation, reaction enthalpies, activation barrier, dipole moments, and other spectroscopic information assist to study the chemical evolution and examine the possibility of detecting higher-order branched-chain molecules in high-mass star-forming regions.

References:

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