Theoretical Models of Complex Molecule Formation

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Pathways leading to the formation of complex organic molecules will be described. Gas phase processes that may build large carbon-chain species in cold molecular clouds will be summarised. Catalytic reactions on grain surfaces can lead to a large variety of organic species, and models of molecule formation by atom additions to multiply-bonded molecules will be presented. The subsequent desorption of these mixed molecular ices can initiate a distinctive organic chemistry in hot molecular cores.

The predictions of this theory will be compared with observations to show how possible organic formation pathways in the interstellar medium may be constrained. In particular, the success of the theory in explaining trends in the known interstellar organics, in predicting recently-detected interstellar molecules, and, just as importantly, non-detections, will be discussed. The most urgently needed laboratory data required by these and future theoretical models, both for gas-phase and solid-phase reactions, will be emphasized.