CHEMICAL REACTIONS ON SMALL INTERSTELLAR DUST GRAINS

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Chemical ractions on dust grains are of crucial importance in interstellar chemistry because they are responsible for the production of molecular hydrogen as well as a variety of complex organic molecules. The computational modeling of chemical reaction networks on dust grains is typically done using rate equations. However, for reactions taking place on the surfaces of dust grains, rate equations are not always valid. This is because they ignore fluctuations as well as the discrete nature of the atomic and molecular species. Recently, a master equation approach[a] was proposed, that is suitable for the simulation of chemical reactions on microscopic grains. In this talk I will present some applications of the master equation. The production rates of molecules are calculated, taking into account the size distribution of the dust grains and the physical conditions relevant to interstellar medium. The master equation method will be also discussed in the context of Complex reaction networks which form organic molecules such as methanol (CH_3OH) and formaldehyde (H_2CO).

[a] O. Biham, I. Furman, V. Pirronello and G. Vidai, ApJ 553 (2001)