

Effect of carbon grain destruction on chemical structure in protoplanetary disks

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The bulk composition of Earth is dramatically carbon poor compared to that of the interstellar medium, and this tendency extends to the asteroid belt. There is a gradient in the amounts of condensed carbon relative to silicate.

Based on Lee et al. (2010), we calculate the molecular abundances in the protoplanetary disk using chemical reaction network, taking into account of carbon grain destruction in the inner disk. In this study, we consider two kinds of gas-phase abundances of carbon as initial condition. First, the normal abundance of Taurus molecular cloud, where oxygen abundance is larger than carbon abundance, is assumed. Second, we considered that all the carbon in the grain are sputtered into gas-phase, and thus the abundance of carbon is larger than that of oxygen. We compared the molecular abundances at different distance from the central star and find the differences between two initial conditions. Furthermore, we calculate the fraction of carbon in/on grains at different radii of the disk in order to understand the gradient of condensed carbon in our solar system.

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