

**GAS-GRAIN REACTIONS OF PRESOLAR CARBON AND SILICON CARBIDE DUST IN PROTOPLANETARY DISCS.** E. Lüttjohann, and H.-P. Gail. Institut für Theoretische Astrophysik, Univ. Heidelberg, 69120 Heidelberg, Germany.

**Introduction:** Dust in preplanetary discs around young stars is a complex mixture of species with widely differing compositions and origins [1,2]. The inner part of the disc (<10 AU) is filled with a complex mixture of condensed phases formed under widely disparate conditions like that encountered in cold interstellar space and hot interior regions of accretion discs.

Silicon carbide is particularly important carrier of information about stellar evolution. Grains of silicon carbide include noble gases, which were trapped into the grains during grain formation. Xe-S and Ne-E(H) isotopes are characteristic of s-process (see [3]), which occurred in AGB stars. The inclusions and trace elements like N, Al, Ti, Ca, Fe, Sr, Zr, Mo and others were studied in a subset of SiC grains. Presolar silicon carbide grains are very good studied and provide a lot of information about formation history and origin of the presolar grains.

Presolar carbon grains include also an important information about isotopic anomalies in meteorites. The presolar carbon grains come from a couple of sources at different evolutionary stages. Isotopic characteristics shows, where they were formed either in supernovae [4] or in AGB stars, or in J stars. Carbon grains destruction is also important for calculation of hydrocarbon chemistry [5].

The results of experimental analysis show the the amount of presolar silicon carbide grains is about tenfold of the amount of presolar carbon grains [6]. In contrast to that calculations of Zhukovska et al. [7] predict almost inverse ratio. To explain this difference of the abundances we investigate the paths of destruction for these presolar dust grains under conditions in the protoplanetary discs.

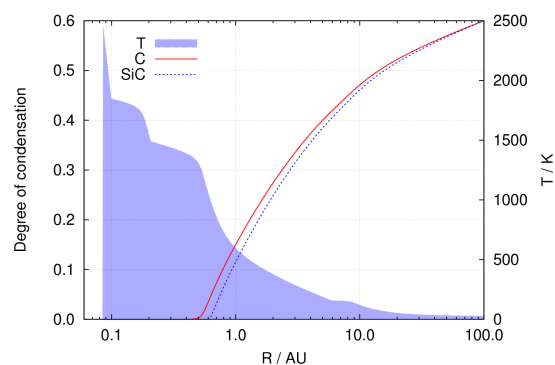
**Method:** We present new model calculations of the dust mixture in accretion discs based on a one-zone  $\alpha$ -disc model that is self-consistently coupled with the set of transport-reaction equations for dust processing in order to consider correctly the non-linear coupling between dust processing, dust opacity and disc evolution. The model considers the important physical and chemical processes, similar as in [8].

Using experimental data of [9] we calculate the destruction rate of silicon carbide. The

conducted experiment was in a gas with composition similar to the gas composition in protoplanetary discs.

We assume that the destruction rate of presolar carbon grains is determined by the reaction with OH-radicals on the surface of soot particles [10].

**Results:** The calculations of the destruction of silicon carbide and carbon presolar grains show no remarkable difference in the destruction mechanism of these dust species (see Fig. 1).



**Figure 1:** Degree of condensation of SiC (dashed line) and carbon (solid line) as function of the distance to the protostar. The filled line represent the temperature profile in the disc.

The possible cause of the abundance ratio C/SiC observed in laboratory studies of meteorites can be destruction processes in parent bodies of meteorites. Perhaps aluminium nitride as solid solution component save SiC grains forming a passivating aluminium oxide film on the surface of the grains.

**References:** [1] Wooden, D. et al. (2007) *Protostars & Planets V*, 815-833. [2] Watson, D.M. (2009) *arXiv:0902.2744*. [3] Hoppe et al. (1994), *Astrophys.J.*, 430, 870. [4] Nittler(1996) [5] Gail, H.-P. (2002), *A&A*, 390, 253. [6] Nguyen, et al. (2007) *ApJ*, 656, 1223. [7] Zhukovska et al. (2008) *A&A*, 479, 453. [8] Gail, H.-P. (2004) *A&A*, 413, 571. [9] Mendybaev, R. A et al. (2002) *Geochim. Cosmochim. Acta*, 66,661-682. [10] Duschl et al. (1996), *A&A*, 312, 624.