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Crystallization of Dust in Space

TETSUO YAMAMOTO
Inst. Low Temperature Sci., Hokkaido University

First, I will give a brief summary on the physics of elementaryprocesses of crystallization from both theoretical and experimentalsides. The elementary processes of crystallization consists of 1) nucleation of crystalline seeds in an amorphous medium (i.e. glass) and 2) growth of crystalline nuclei to macroscopic crystals. As a topic of crystallization of astrophysical dust, I will discusscrystalline silicate observed in various astrophysical objects. Sincethe first identification of crystalline silicate feature in comet Halleyin the wavelength region of 8 to 13$$m (Bregman et al. 1987, Campins Ryan 1989), similar crystalline silicate features have beenclearly observed in various kinds of objects including circumstellardust around evolved stars, in YSOs. in disks aroung young main sequancestars such as beta-Pic, and in zodiacal light. On the other hand, nocrystalline feature has been observed in the dust in diffuseinterstellar medium and molecular clouds (see Hanner 1999, Hanner &Bradley for reviews). I will review proposed mechanisms of crystallization of silicate dust inspace, and propose a new nonthermal crystallization mechanism, whichaccounts for the observed 10$$m crystalline silicate feature. References Bregman, J. D., Campins, H., Witteborn, F. C., Wooden, D. H., Rank, D. M., Allamandola, L. J., Cohen, M., Tielens, A. G. G. M.1987, Astronomy and Astrophysics, 187, 616 Campins, H., & Ryan, E. V.1989, Astrophyical J.341, 1059 Hanner, M. S.1999, Space Science Rev., 90, 99 Hanner, M. S. & Bradley, J. P.2003, in “Comets” II, eds. ∼M. ∼Festou, H. U. ∼Keller, H. A. ∼Weaver, University of Arizona Press, p. ∼555 Yamamoto, T. & Chigai, T.2006, Highlights in Astronomy, in press