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Iron and silicate dust growth in the Galactic interstellar medium: clues from element depletions

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The question "What is the dominant mechanism of dust formation?"has long been the matter of debate. We address this question by modelling the distribution of interstellar Fe and Si element abundances in the local Milky Way with dust evolution model. The model follows the time evolution of grains in inhomogeneous, multiphase interstellar medium from high-resolution hydrodynamic simulations of the lifecycle of giant molecular clouds. This allows us to include the dependence of dust destruction in SN shocks and growth by accretion of gas-phase metals on local physical conditions. We find that the growth of iron and silicate grains occurs already in the cold neutral medium, with the Coulomb focusing playing an important role to enhance the collision rates. In order to reproduce the heavier depletion of interstellar Fe compared to Si, our model requires that solid iron resides in two dust components: (i) metallic iron nanoparticles with sizes in the range of 1-10 nm and (ii) small inclusions in silicate grains.

Consider for a poster?

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