

## **Si and Cr diffusion in liquid iron: kinetic implications for the chemical evolution of planetesimal cores**

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According to current models of the Earth's core-mantle differentiation, substantial amounts of Si and Cr should have partitioned into the metallic Fe-Ni cores of early accreted bodies. In contrast to these predictions, however, the Si and Cr contents of iron meteorites, which are derived from the metallic cores of early-formed planetesimals, are surprisingly low. We propose that molten planetesimals originally contained high concentrations of Si and Cr but that these elements became increasingly lithophile during cooling and were extracted from the core by reaction at the base of the silicate mantle at a rate controlled by their diffusion through boundary layers. Chemical diffusion of Si and Cr in liquid iron has been investigated experimentally under *P-T* conditions of 3–11 GPa and 1859–2223 K using a multianvil press and theoretically using first principles molecular dynamics calculations. Diffusion kinetic data are used to model the rate of chemical evolution of planetesimal cores.