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# Plastic deformation of FeSi at high pressures: implications for planetary cores

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The cores of terrestrial planets is mostly comprised of a Fe-Ni alloy, but it should additionally contain some light element(s) in order to explain the observed core density. Silicon has long been considered as a likely candidate because of geochemical and cosmochemical arguments: the Mg/Si and Fe/Si ratios of the Earth does not match those of the chondrites. Since silicon preferentially partition into iron-nickel metal, having 'missing' silicon in the core would solve this problem. Moreover, the evidence of present (e.g. Mercury) or ancient (e.g. Mars) magnetic fields on the terrestrial planets is a good indicator of (at least partially) liquid cores. The estimated temperature profiles of these planets, however, lay below iron melting curve. The addition of light elements in their metal cores could allow reducing their core-alloy melting temperature and, hence, the generation of a magnetic field. Although the effect of light elements on the stability and elasticity of Fe-Ni alloys has been widely investigated, their effect on the plasticity of core materials remains largely unknown. Yet, this information is crucial for understanding how planetary cores deform.

Here we investigate the plastic deformation of $\varepsilon$-FeSi up to 50 GPa at room temperature employing a technique of radial x-ray diffraction in diamond anvil cells. Stoichiometric FeSi endmember is a good first-order approximation of the Fe-FeSi system and a good starting material to develop new experimental perspectives. In this work, we focused on the low-pressure polymorph of FeSi that would be the stable phase in the cores of small terrestrial planets. We will present the analysis of measured data and discuss their potential application to constrain plastic deformation in planetary cores.