*American Mineralogist, Volume 99, pages 720–723, 2014*

# Solid phases of FeSi to 47 GPa and 2800 K: New data

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## Abstract

FeSi remains crystalline up to at least 2350 (±200) K at 23 GPa and 2770 (±200) K at 47 GPa in a laser-heated diamond-anvil cell, showing that addition of silicon does not cause a large amount of melting point depression; the melting temperature of pure iron ranges from 2300 (±100) K to 2700 (±150) K between 20 and 50 GPa. The transition between ε (B20) and B2 (CsCl-structured) crystalline phases occurs at 30 (±2) GPa at all temperatures from 1200 to 2400 K. The resulting 5% density increase may cause an increase in the miscibility of silicon in iron at $P > 30$ GPa, with potential implications for the cores of small rocky planets such as Mars and Mercury.

**Keywords:** High pressures, high temperatures, phase transitions, lunar and planetary materials