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^{57}Fe nuclear forward scattering of synchrotron radiation in hedenbergite $CaFeSi_2O_6$ at hydrostatic pressures up to 68 GPa

L. ZHANG,[1] J. STANEK,[2] S.S. HAFNER,[1,*] H. AHSBAHS,[1] H.F. GRÜNSTEUDEL,[3] J. METGE,[3] AND R. RÜFFER[3]

[1]Scientific Center of Materials Sciences and Institute of Mineralogy, University of Marburg, 35032 Marburg, Germany
[2]Institute of Physics, Jagiellonian University, 30-059 Cracow, Poland
[3]European Synchrotron Radiation Facility, 38043 Grenoble Cedex, France

ABSTRACT

The ^{57}Fe nuclear forward scattering (NFS) of synchrotron radiation and the use of diamond anvils with helium as pressure medium allowed study of the electronic state of Fe^{2+} in the chain silicate hedenbergite $CaFeSi_2O_6$ at pressures up to 68 GPa. Characteristics of NFS time spectra were compared with those of conventional Mössbauer spectra.

NFS time spectra of ^{57}Fe in hedenbergite revealed a reversible phase transition between 53 and 68 GPa at room temperature, which is probably a transition from the paramagnetic phase at low pressures to a magnetic phase at high pressures. If this interpretation is correct, the Néel temperature T_N of hedenbergite depends critically on pressure (T_N = 45 K at 1 atm).