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Effects of high pressure and high temperature on cation ordering in magnesioferrite, $MgFe_2O_4$, using in situ synchrotron X-ray powder diffraction up to 1430 K and 6 GPa

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ABSTRACT

Disorder in stoichiometric magnesioferrite, $MgFe_2O_4$, was determined from in situ synchrotron powder X-ray diffraction data [$\lambda = 0.3738(4)$ Å] at 6, 5, and 3 GPa and temperatures up to 1430 K. The *a* unit-cell parameter increases linearly on heating at the three different pressures. Higher pressures cause a smaller cell volume, as expected. Cation order was analyzed in terms of the inversion parameter, *x*, $\{^{iv}[Mg_{1-x}Fe_x]^{vi}[Mg_{x/2}Fe_{1-x/2}]_2O_4\}$ and the order parameter $Q = 1 - (3/2)x$. As pressure increases, the inversion parameter increases in inverse $MgFe_2O_4$ spinel. O'Neill and Navrotsky (1983) and Landau models were used to describe the equilibrium non-convergent ordering process in $MgFe_2O_4$, and they both fit the data well.