

# Thermodynamics of the fcc-hcp transition in the iron-nickel system

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Earth's core is known to be composed of metallic iron-nickel alloyed with a few weight percent of lighter elements. As a key component of the core, metallic iron-nickel is of great interest to geoscientists; understanding this system is critical to gaining insight into Earth's core. Metallic iron-nickel has also been proposed to exist as a minor component in Earth's mantle as the result of disproportionation of  $\text{Fe}^{2+}$ . The phase relationships and equations of state of the iron-nickel system have been extensively investigated by high-temperature, high-pressure experiments, but these studies have not yet covered the entire range of pressures, temperatures, and compositions relevant to Earth's interior. In this work, we present a thermodynamic description of the fcc-hcp phase loop in the iron-nickel system at geologically relevant temperatures and pressures, based upon experimental data. This work can be used to further understand the iron-nickel system and construct phase diagrams at P, T, X conditions that experiments have not yet probed.