The Effect of Nickel on Iron Isotope Fractionation

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The Earth's core is thought to be composed mainly of an iron-rich iron nickel alloy, and therefore determining the behavior of these alloys at core conditions is crucial for interpreting and constraining geophysical and geochemical models. Understanding the effect of nickel on isotope fractionation can shed light on large-scale planetary formation processes. We collected a series of phonon excitation spectra using nuclear resonant inelastic x-ray scattering (NRIXS) on 57Fe-enriched iron nickel alloys with varying ($Fe_{0.9}Ni_{0.1}$, $Fe_{0.8}Ni_{0.2}$, $Fe_{0.7}Ni_{0.3}$) nickel content at pressures up to 50 GPa. The phonon density of states was then extracted to determine the effect of nickel content on iron isotope fractionation and the resulting implications for planetary core formations and bulk composition for terrestrial planets.