Title: Minor and trace element concentrations in adjacent kamacite and taenite in the Krymka chondrite

Abstract:

We report NanoSIMS in situ siderophile minor and trace element abundances in individual Fe-Ni metal grains in the unequilibrated chondrite Krymka (LL3.2). Associated kamacite and taenite of 10 metal grains in four chondrules and one matrix metal were analyzed for elemental concentrations of Fe, Ni, Co, Cu, Rh, Ir, and Pt. The results show large elemental variations among the metal grains. However, complementary and correlative variations exist between adjacent kamacite-taenite. This is consistent with the unequilibrated character of the chondrite and corroborates an attainment of chemical equilibrium between the metal phases. The calculated equilibrium temperature is 446 ± 9 °C. This is concordant with the range given in literature for the Krymka post-accretion thermal metamorphism. Based on Ni diffusivity in taenite, a slow cooling rate is estimated of the Krymka parent body that does not exceed ~1K Myr-1, which is consistent with cooling rates inferred by other workers for unequilibrated ordinary chondrites. Elemental ionic radii might have played a role in controlling elemental partitioning between kamacite and taenite. The bulk compositions of the Krymka metal grains have nonsolar (mostly subsolar) element/Ni ratios suggesting the Fe-Ni grains could have formed from distinct precursors of nonsolar compositions or had their compositions modified subsequent to chondrule formation events.