Experimental investigation of Cr isotope fractionation during core formation

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The Cr stable isotope composition of the bulk silicate Earth (BSE) is heavy compared to that of chondrites, which has been interpreted to reflect Cr isotope fractionation between metal and silicate during core formation [1]. Theoretical predictions of the Cr isotope fractionation factors indicate that core formation must have occurred at relatively low temperatures to account for the observed Cr isotope fractionation [1]. Low temperatures are inconsistent with the conditions inferred for metal-silicate equilibration in a deep terrestrial magma ocean, implying that a large fraction of the Earth's core may have formed by merging of metal cores from smaller precursor bodies. Because of the broad significance of this implication for understanding the accretion and differentiation of the Earth, we initiated a study aimed at experimentally quantifying the magnitude of the Cr isotope fractionation between metal and silicates at conditions relevant to core formation. We have performed metal-silicate equilibration experiments with efficient separation of metal and silicate liquids, and are currently analyzing the Cr isotope fractionation between the metal-silicate pairs. Our results will show whether metal-silicate equilibration results in Cr isotope fractionation, and if so, will provide new constraints on the physical and chemical conditions during formation of the Earth's core.

References: [1] Moynier et al. (2011) *Science* 331.