Mutual constraints between lighter and heavier element compositions of Earth's core from geochemistry and mineral physics experiments

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The Earth's core contains up to 1 wt.% carbon, at least 2 wt.% sulfur, and possibly oxygen and silicon as additional major elements that are lighter than iron and nickel. Previous studies showed that the presence of lighter elements could strongly influence the partitioning of heavier elements such as potassium, lead, and platinum group elements during core segregation and inner core formation [1]. Here we review existing knowledge [2] and report new experimental results on the melting behaviors and physical properties of iron-lighter-element alloys from synchrotron X-ray diffraction experiments and on the partitioning of minor or trace elements between molten metal and silicate from multi-anvil experiments. We will examine the interplay between the fates of lighter and heavier elements as the Earth grew from planetesimals with varying degrees of differentiation. The implications of combined constraints from geochemistry and mineral physics for core composition will be discussed.

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