Sulfur contents of planetary and protoplanetary cores

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The composition of Fe-rich cores influences the chemical and physical processes governing planetary differentiation. Sulfur is an important component of protoplanetary cores, but sulfur in Earth's core is expected to be less than 2wt%, as implied by the volatility trend of elements in the bulk Earth. This limit assumes that the order of element volatilities calculated for solar nebula condensation is also appropriate to planetary compositions. The assumption can be tested against measured siderophile element abundances in iron meteorites; these exhibit volatility depletions that sometimes even exceed those in Earth. Estimates of S content in parent metallic melts have been reported for several magmatic iron groups, and in most cases the cosmochemical estimates of sulfur in these protoplanetary cores are significantly higher than would be expected on the basis of their volatility trends. Varying gas pressure decouples sulfur from lithophile and siderophile elements in condensation calculations. Unless the crystallization models applied to the iron meteorite groups are inaccurate, the volatility sequence used to predict sulfur in Earth appears to be violated for sulfur in protoplanets. Hence, it remains plausible on cosmochemical grounds that Earth's core is more S-rich than is normally considered.