

High temperature formation of the oxygen-rich Martian core

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Discovery of a large Martian core with a large radius and low mean density around $6\sim 6.5$ g/cm³ provided a new constraint for the composition of the Martian core. The early Martian core formation inferred from W-Hf data of SNC meteorites revealed that the fractionation and core formation of Mars occurred within the first 5 million years after the CAI formation, resulting in the super-liquidus temperature during the core formation stage of Mars due to existence of radiogenic element such as ²⁶Al in the early solar system. The metallic iron-silicate partitioning of oxygen and sulfur indicates a high concentration of oxygen at high temperature 400-600 K above the liquidus of the Martian mantle. Thus, the major light elements in the Martian core may be oxygen instead of sulfur, which can account for the observed density and compressional velocity of the Martian core. Liquid immiscibility in the Fe-O-S Martian core during cooling may explain the evolution and extinction of the Martian core dynamo.

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