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The chemical case for Mercury mantle stripping

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Mercury, the Solar System's innermost planet, has an unusually massive core prompting speculation that somehow the planet lost silicate after it formed. Using the equally unusual high sulfur and low iron composition of its surface and space geodetic constraints on its core composition, and a single-stage core formation model under magma ocean conditions, we show Mercury's chemistry to be compatible with formation in a larger planet, 2-3 times Mercury's present mass. Mercury could have lost a substantial fraction of its rocky material through impacts or by being a remnant impactor itself. Silicate meteoritic debris from an impact with Mercury would likely be characterized by significant 30Si isotopic enrichment (> +0.15‰ relative to parent sources that could aid identification of a new meteorite class.