

Application of the subduction initiation model to the Iranian ophiolites

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A new model for the earliest stages in the evolution of subduction zones is developed from recent geologic studies of the IBM arc system, and then applied to Cretaceous ophiolites of the inner Zagros ophiolitic belt and outer Zagros ophiolitic belt from Iran. Ophiolites in the inner and outer belt ophiolites formed at the same time during the Late Cretaceous and may have originally been a continuous sheet. Their geochemical signatures are similar to fore-arc basalts and boninites, recovered from the IBM subduction system. Application of the subduction zone infancy model to the Cretaceous ophiolites of Neyriz and Nain-Baft provides a framework in which to understand the rapid formation of oceanic crust with strong arc affinities between younger Iranian arcs and the Haji-Abad subduction complex provide a mechanism for the formation and subsidence of the Zagros basin.

Sulfur isotopic fractionation during the differentiation of Mars

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One of the broader goals in planetary science is to determine the chemical consequences of planet formation. Based on geochemical models, high pressure experiments, and siderophile element abundances in martian meteorites, it has been argued that during the differentiation of Mars, a significant amount of sulfur was incorporated into the core of the planet (~14 wt%). In this study we test whether the sulfur incorporated into the core left an isotopic signature on the mantle of the planet, by looking for a stable isotopic fractionation of S between Fe-FeS core and silicate mantle.

Based on metal/silicate partition coefficients, Kong *et al.* [1] suggested that equilibrium between core forming metal and silicates in Mars occurred at approximately 2200°C and 1 GPa. To start, we performed experiments at 1 GPa and 1850°C using the piston-cylinder apparatus. Starting materials consisted of a Martian mantle composition [2], Fe and FeS. A ³²S spike was added to the experiments to aid in tracing the approach to equilibrium [3]. The isotopic compositions of the quenched samples were measured *in situ* on the Carnegie Cameca ims-6f ion microprobe.

Results indicate that at the high temperature condition of our experiments there is a resolvable S isotopic fractionation, $\Delta^{34}\text{S}$ (metal-silicate) = $2.2 \pm 1.4\%$, possibly explaining the $\delta^{34}\text{S}$ value of the QUE94201 meteorite [4].

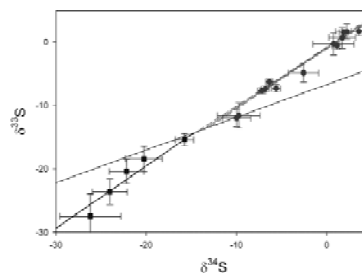


Figure 1. Three isotope plot showing the approach to equilibrium of S in silicate (blue squares) and in metal (red circles).

[1] Kong *et al.* (1999) *GCA* **63**, 1865-1875. [2] Bertka and Fei (1997) *JGR* **102**, 5251-5264. [3] Shahar *et al.* (2008) *EPSL* **268**, 330-338. [4] Greenwodd *et al.* (1997) *GCA* **61**, 4449-4453.