Sub-solidus (metasomatic) evolution of primary (magmatic) granitoids to form new granitic rocks: Examples from plutonic complexes of the Sanandaj-Sirjan metamorphic belt, Iran

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Outcrops of many mafic, intermediate and felsic plutonic bodies occur in the Sanandaj-Sirjan metamorphic belt, Iran. Granitoids of the various typology (i.e., S-, I- and A-type) comprise the major parts of the outcrops of plutonic rocks in the belt. Field, petrographic and geochemical evidence support the idea that many granitic rocks (e.g., monzogranites and syenogranites) within the belt (e.g., within the Alvand and Marivan complexes) are evolved in deformation zones from previous granodiorites-tonalites (with a primary magmatic origin). The restricted occurrence of syenogranites (K-rich granitoids) within the high strain zones (e.g., in mylonitic zones), the limitation of the occurrence of secondary microcline to deformed rocks, the partial to complete replacement of plagioclase by K-feldspar (from margin to core of plagioclase porphyroclasts producing overgrowth textures) and metasomatic intergrowth textures (myrmekite around deformed porphyroclasts of feldspars) confirm that some granitic rocks which primarily had a magmatic fabric (and origin), have experienced some metasomatic (sub-solidus) stages of evolution (re-crystallization). K-rich characteristic of deformed and evolved rocks (in contrast to their undeformed varieties lacking K-feldspar) indicate that an input of K from external source(s) into the granitic bodies (during deformation and sub-solidus re-crystallization) has occurred.

Experimental evidence for silicon isotope fractionation between silicate and Si in Fe metal

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The composition of Earth's core remains largely unknown. Among the lighter major elements, silicon may be an important constituent, as suggested by a super-chondritic Mg/Si for bulk silicate Earth and experimental evidence that silicon alloys with iron metal at high pressure and temperature. Stable isotopes can be used to identify hidden reservoirs of major elements if the isotope fractionation between reservoirs is understood.

Two recent isotopic studies report silicon isotopic ratio analyses of meteorites compared with terrestrial values. Georg *et al.* [1], found a difference between Earth and chondrites and concluded that the difference is a consequence of $^{30}Si/^{28}Si$ fractionation between core and mantle. Fitoussi *et al.* [2], on the other hand, found that there is no resolvable difference in $^{30}Si/^{28}Si$ between Earth and chondrites. Both studies appeal to theoretical predictions of $^{30}Si/^{28}Si$ fractionation of ~1.5‰ between Si in silicate and Si in Fe metal [1]. We have conducted experiments in order to evaluate whether there is indeed a Si isotope fractionation between these phases at high P and T.

The prelimiary experiments were performed in a piston cylinder apparatus at 1800°C and 1 GPa. The starting material was a CI-like composition combined with a metallic $Fe_{87}Si_{13}$ powder. Experiments were spiked with ^{28}Si as a means of tracking the approach to equilibrium [3]. The experimental run products formed a metallic "core" and silicate "mantle" that were measured for their silicon isotopic ratio. The results show that there is a resolvable fractionation between metal and silicate on the order of 1‰ in $\delta^{30}Si$, where the silicate is more enriched in ^{30}Si than the metal, agreeing with the direction and magnitude of theoretical predictions [1].

[1] Georg R. G. *et al.* (2007) *Nature* **447** 1102-1106.
[2] Fitoussi C. *et al.* (2007) *Eos Trans. AGU* **88** U11A-0022.
[3] Shahar A. *et al.* (2008, in press) *EPSL.*