

Sr-Nd-Hf-Pb isotope mapping of Tien Shan in Uzbekistan

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Sr-Nd-Hf-Pb isotope mapping combined with U-Pb zircon SHRIMP ages and Re-Os sulphide geochronology of granitoids from profiles across terrane boundaries in Uzbekistan reveal distinct reservoir types (cratonic vs turbiditic), corresponding to diverse nature and origin of granitic magmatism and its hosted ore-forming processes. Three main tectonic domains are recognized: Middle Tien Shan, Southern Tien Shan and Karakum microcontinent.

Sr-Nd isotopes (whole-rock) of all domains show a wide range of ϵ_{Ndt} (-5 to +7) and ($^{87}\text{Sr}/^{86}\text{Sr}$)_t predominantly between 0.704 and 0.707, indicating involvement of both mantle-derived material (e.g., subduction of oceanic crust) and older crustal sources (Mesoproterozoic model ages).

The large range of **Hf-isotope** compositions found in zircons of granites from Kurama, Middle Tien Shan, ($\epsilon_{\text{Hf}} \sim -6$ to +5) suggest recycling of older heterogeneous crustal protolith(s). In the Southern Tien Shan involvement of subducted oceanic crust is exemplified by juvenile ϵ_{Hf} values of up to +14 (Sultan-Uvais) and +16 (Teksquduk-Kyzylkum). However, Permo-Carboniferous granitoids crossing all terrane boundaries exhibit predominantly crustal signatures indicating Neoproterozoic protoliths.

Pb isotopes (whole-rock) exhibit a present-day range of $^{206}\text{Pb}/^{204}\text{Pb}$ 18.229-20.718, $^{207}\text{Pb}/^{204}\text{Pb}$ 15.607-15.823 and $^{208}\text{Pb}/^{204}\text{Pb}$ 38.077-39.827. These are in full agreement with Sr-Nd-Hf isotopes indicating the dominance of a crustal component as well as crust-mantle mixing processes.

The granitoid samples from Middle Tien Shan, Southern Tien Shan and Karakum microcontinent show a variation of crustal to mixed signatures with a significant contribution of older components. *This is a contribution to IGCP-592 sponsored by IUGS-UNESCO.*

Competitive adsorption/desorption of arsenate and phosphate at the ferric hydroxide-water interface

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The kinetics of $\text{As}_{(\text{V})}$ and PO_4 adsorption/desorption on ferric hydroxide were investigated at pH 4 and pH 8 in 0.1 M NaCl. Individually, these oxyanions showed similar adsorption on the substrate and greater adsorption at pH 4 than at pH 8. In competitive adsorption experiments, greater adsorption of $\text{As}_{(\text{V})}$ compared to PO_4 was observed at both pH conditions. Sequential loading of $\text{As}_{(\text{V})}$ followed by PO_4 , and vice versa, was aimed at studying the co-oxyanion induced desorption kinetics of $\text{As}_{(\text{V})}$ and PO_4 (Fig. 1). The kinetic data were successfully fit by pseudo-second order, Elovich, and power-function equations.

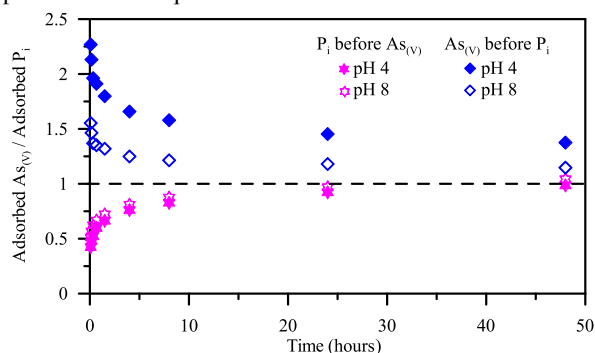


Fig. 1. Molar ratio plots for sequential loading of co-oxyanion after pre-equilibration of $\text{As}_{(\text{V})}$ or PO_4 (P_i) on ferric hydroxide at pH 4 and 8.

Selected samples were used for the As K-edge EXAFS spectroscopy to understand the changes in adsorption mechanisms of $\text{As}_{(\text{V})}$ with time in the presence/absence of PO_4 . EXAFS analysis indicated the presence mononuclear (^2E) and binuclear (^2C) bidentate $\text{As}_{(\text{V})}$ surface complexes. Fe coordination numbers (CN) increased with increasing time and decreased with addition of PO_4 into the system. Relatively, the higher proportion of CN associated with ^2E , compared to ^2C , was decreased after the addition of PO_4 . The competitive desorption study indicates that the excessive input of PO_4 due to the overuse of fertilizers could mobilize $\text{As}_{(\text{V})}$ from contaminated geomedias through competitive desorption.