

A reappraisal of the petrology and origins of the Lherz peridotite

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The massifs of the eastern Pyrenees have been the focus of a number of extensive studies and have made a significant contribution to our understanding of mantle composition and evolution. Specific problems remain, in particular the relationship between adjacent harzburgites and lherzolites, which have been proposed to be either; (1) melt depletion of an original lherzolite [2, 3] or, (2) refertilisation of a primary harzburgite by basaltic melt [1, 4].

Whole rock and clinopyroxene compositions of the peridotites and associated pyroxenites offer a means of resolving the nature of the relationship between harzburgites and lherzolites. Whole rock major and trace element analyses show that the lherzolites have a range of compositions while the harzburgites are relatively uniform. Laser ablation analyses of individual clinopyroxenes indicate some variation of lherzolite sample composition whilst harzburgites alone display marked LREE enrichment.

Whole rock ¹⁸⁷Os - ¹⁸⁸Os values define a broad positive correlation with ¹⁸⁷Re-¹⁸⁸Os and indices of melt depletion (Al₂O₃ and S). Model ages derived from these correlations range from ~1.4Ga to ~1.5Ga. Re-Os isotope systematics alone define an errorchron corresponding to an age of ~1.7Ga. These model ages are all younger than those reported in the literature [3, 5], which previously suggested a melt depletion event across the Pyrenean suite at 1.9-2.4Ga.

References

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U(VI) sorption on sandstone: Experiments and modeling

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Experimental

The sorption of U(VI) on natural and synthetic sandstone was investigated in batch sorption experiments (air atmosphere, 0.1M NaClO₄, pH 3-11, [U(VI)] 10⁻⁹-10⁻⁴M). The synthetic sandstone was a mixture of quartz with muscovite and hematite. The surface area (N₂-BET) of quartz was 0.047 m²/g, of muscovite 0.88 m²/g, of hematite 0.89 m²/g and of natural sandstone (mainly quartz) 0.69 m²/g.

Results and discussion

The pH dependence shows a maximal sorption between pH 5.5-7.5. The U(VI) sorption varied between 95% (10⁻⁹M) and 7% (10⁻⁴) on natural sandstone, and between 80% (10⁻⁹M) and 2% (10⁻⁴M) on synthetic sandstone. Fig. 1 shows the comparison of sandstone with pure components (at similar conditions) quartz, muscovite, and hematite. More U(VI) was adsorbed on natural and on synthetic sandstone, than on quartz. The higher sorption are caused by the other components muscovite and hematite, and by the higher surface area.

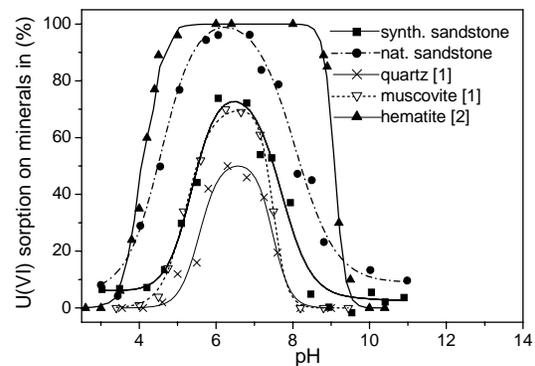


Fig. 1: pH dependence of U(VI) sorption: Comparison of pure components of synthetic sandstone with the mixture and with natural sandstone.

The linear Freundlich sorption isotherms indicate one binding type. Sorption predicted by the Diffuse Double Layer Model (using the code FITEQL) agreed with the experimental sorption values within their uncertainty.

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References

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