

Competitive adsorption between tricarboxylic acids and phosphate

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The mobility and bioavailability of organic and inorganic ligands in soils and aquifers are dependent on interactions with mineral surfaces. Carboxylic acids are a group of organic ligands that have been noticed to be excreted by roots as a response to several stressful conditions, i.e. phosphorus depletion, iron deficiency and toxic aluminium conditions.

Citrate, a hydroxyl-tri-carboxylic acid, is known to be excreted by various plant species under all of the above mentioned conditions. The phosphate acquisition is thought to take place through dissolution of phosphate-rich minerals and/or through competitive adsorption between the organic acid and the nutrient on mineral surfaces. The present work focuses on the comparison of the competitive adsorption between citrate and phosphate on goethite (α -FeOOH) with that of two other tricarboxylic acids; tricarballic acid and 1,2,4-butanetricarboxylic acid. Tricarballic acid is identical to citrate without the hydroxyl group and 1,2,4-butanetricarboxylic acid has the same molecular structure as tricarballic acid with one extra CH_2 -group between two of the carboxylic groups. The aim of this work is to elucidate what effect small differences in structure and composition of otherwise similar organic ligands has on the ability to compete with phosphate for mineral sites.

In order to meet the research objectives, a combination of quantitative adsorption data and molecular spectroscopic data were collected. The work was made in series of batch experiments, measuring ligand adsorption as a function of pH. In-situ ATR-FTIR spectroscopy was extensively used to evaluate the speciation and adsorption mechanisms of phosphate and the carboxylic acids. In addition, ionic chromatography and atomic absorption spectroscopy were used to gain quantitative adsorption and dissolution data. Adsorption data of the three organic acids and of phosphate will be presented to illustrate the competitive adsorption in these systems and ATR-FTIR spectra will be used to explain the mechanisms behind the competition.

Laser Raman-spectroscopy study on fluid inclusions of sandstone-type uranium deposits in the Ordos basin, Northwest China

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Introduction

The Ordos basin is the second largest sedimentary basin in China. With the deep-going ore exploration, in-situ leachable sandstone-type uranium deposits have been discovered in several localities in different parts of the basin (Liu, 2005; Ling *et al.*, 2006). This study focuses on the compositions of fluid inclusions bearing in sandstones of these uranium deposits as well as their genesis.

Experiment and Results

The chemical compositions of fluid inclusions are determined with RM-1000 laser Raman spectroscopy produced by Renishaw Company, at the State Key Lab of Geol. Proc. & Mineral Res., China University of Geosciences. The results show that most of the fluid inclusions are mainly composed of H_2O , CO_2 and CH_4 . The fluid compositions existing in different phase manifest their distinct original fluid genesis. The relative high concentration CH_4 captured in fluid inclusions indicates that original fluids might come from the natural gases widely spreading in the Ordos basin. The fluid inclusions formed and their components accumulated in the reduced condition, whereas uranium minerals deposited later when the oxygenation was dominated caused by uplifting of the Ordos basin during Mesozoic-Cenozoic. This study is of significance for understanding the uranium formation with multi-energy resources and mineral deposits coexisting in the Ordos basin.

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References

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