

Kinetics of Rb isotope equilibration in Savannah River Site soils

J. M. WAMPLER¹, W. CRAWFORD ELLIOTT^{1*}, EIRIK J. KROGSTAD², BERND KAHN³, LAURA ZAUNBRECHER¹, AND DANIEL I. KAPLAN⁴

¹Georgia State University, Atlanta, GA, USA, claylab@gsu.edu (* presenting author)

²Pacific Northwest National Laboratory, Richland, WA, USA Eirik.Krogstad@pnnl.gov

³Georgia Institute of Technology, Atlanta, GA USA, Bernd.Kahn@gtri.gatech.edu

⁴Savannah River National Laboratory, Aiken, SC, USA daniel.kaplan@srnl.gov

Most of the Rb and nearly all of the Cs in near-surface soils of the Savannah River Site (SRS) appear to be fixed in interlayer wedge zones within hydroxy-interlayered vermiculite (HIV) particles [1]. To further investigate this idea, we studied the equilibration of added, highly enriched ⁸⁵Rb with natural soil Rb under mildly acidic and mildly basic conditions. Consistent results from four soil samples in acidic suspension show equilibration of the added ⁸⁵Rb with from 4% to 6% of the soil Rb in one day, followed by continued slow equilibration until after two months about twice as much of the soil Rb had equilibrated with the added ⁸⁵Rb. Equilibration was faster and continued to greater extent when soil was suspended in NaHCO₃ solution, on average by a factor of about 2 in rate and extent. We attribute the faster and more extensive equilibration in basic suspensions to slight expansion of the vermiculite interlayers, and of the adjoining interlayer wedges, as hydrated Na ions replaced the natural exchangeable acidity and as hydroxy-Al polymers were neutralized.

Data obtained earlier by Goto *et al.* [2] show that equilibration of natural soil Cs with ¹³⁷Cs proceeds more rapidly and is more extensive than what we observed for Rb. Up to 20% of the soil Cs equilibrated with the added ¹³⁷Cs under mildly acidic conditions, and up to about 50% under mildly basic conditions, in just four days. We interpret the more rapid and more extensive equilibration of Cs than Rb with an added isotope to indicate that Rb is more deeply entrenched in interlayer wedges of HIV than is Cs, because Rb ions are smaller than Cs ions. This interpretation is in accord with results of another experiment in which we found that added Mg, whose hydrated ions keep vermiculite interlayers expanded, strongly enhances the rate of acid extraction of Cs from SRS soils but has little effect on the rate of extraction of Rb.

[1] Wampler *et al.* (Submitted 2012) *ES&T* [2] Goto *et al.* (2008) *Health Physics* **94**, 18-32.

Interaction of Volatile Organic Compounds with Magnetite Nanoparticles: Fundamentals and Implications for Air Remediation

NERMIN ELTOUNY^{1*}, PARISA A. ARIYA¹

McGill University, Chemistry, Montreal, Canada, nermin.eltouny@mail.mcgill.ca^{1*}

McGill University, Chemistry and Atmospheric and Oceanic Sciences, Montreal, Canada parisa.ariya@mcgill.ca¹

Introduction

Nanoparticles have become one of the most researched topics in the recent years as they are of interest to many fields. We are interested in the fundamental processes between organic vapours and iron oxide nanoparticle for their application in the remediation of polluted air.

Experimental Methods

We show the efficiency of iron oxide nanoparticles for the removal of organic vapours (BTEX) from air. We use various techniques including GC-FID, GC-MS, XRD, XPS and UV-VIS absorption spectroscopy to understand the interaction between gaseous organic molecules and iron oxide nanoparticles.

Results and Conclusion

We will discuss the role of the iron oxide nanoparticle heterogeneity in the interaction with aromatics vapours and the effect of organic vapours on the oxidation state of the iron oxide [1].

Determining the fundamental processes can yield information on the properties that dictate how iron oxide nanoparticles behave in the presence of organic vapours, which allows for improved designs of adsorption media as well better understanding of potential reactions in the environment.

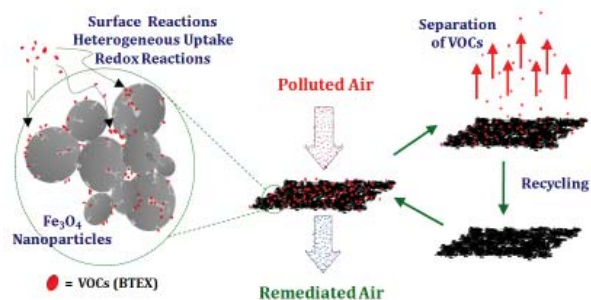


Figure 1. Overview of the removal of BTEX in the gas phase by iron oxide nanoparticles

[1] Eltouny and Ariya (2012) *Submitted to Industrial Chemistry and Engineering Research* (ie-2012-001524)