The effect of ionic strength and hardness of trichloroethylene contaminated groundwater in remediation using granular activated carbon

JOONG-HYEOK HEO[1], DAL-HEUI LEE[2], DONG-CHAN KOH[3] AND HO-WAN CHANG[1]

[1]School of Earth and Environmental Sciences (BK21), Seoul National University, Sillim 9-dong, Gwanak-gu, Seoul 151-747, Republic of Korea

[2]Research Institute of Groundwater and Soil Environment, Yonsei University, Seodaemun-gu, Seoul 120-749, Republic of Korea

[3]Groundwater Environment Group, Korea Institute of Geoscience and Mineral Resources, 30 Gajeong-dong, Yuseong-gu, Daejeon 305-350, Republic of Korea

The objective of this study is to evaluate the effect of ionic strength and hardness of trichloroethylene (TCE)-contaminated groundwater on remediation using granular activated carbon (GAC). The sorption rate of TCE by GAC was observed by batch experiments. The sorption kinetics of the GAC was analyzed by kinetic models. As the ionic strength and hardness of the synthetic groundwater increased, the TCE sorption rates of GAC in the synthetic groundwater decreased. The TCE sorption rates of GAC in synthetic groundwater were 100%, 93.0%, 90.2%, and 86.2%, respectively. These results showed that the TCE sorption rates were affected by the relationship between the ionic strength and the hardness of the synthetic groundwater. The Elovich model is more precise than the Pseudo first order model. This indicates that the Elovich model well represents TCE-contaminated groundwater remediation by GAC. The variation of ion concentration by GAC sorption showed that the cations were largerer than the anions. The sorption capacity of GAC was affected by the cations in the groundwater. The surface area of the GAC was 958.98 m^2/g and the calculated sorption areas of TCE & ions were 318.38 m^2/g, which were 33.2 % of the GAC surface area. Therefore, the ionic strength and hardness of groundwater must be considered in the remediation of TCE-contaminated groundwater using GAC.

The Tagish Lake meteorite: Opportunities in cold curation and analysis

C.D.K. HERD[1]*AND R.W. HILTS[2]

[1]Dept. of Earth and Atmospheric Sciences, University of Alberta, Edmonton, AB T6G 2E3, Canada (*correspondence: herd@ualberta.ca)

[2]Grant MacEwan College, Edmonton, AB T5J 4S2, Canada

Introduction

The Tagish Lake meteorite is an ungrouped carbonaceous chondrite with a high organic carbon content (~2.6 wt%) [1]. Samples of this meteorite collected a few days after the fall [2] now reside at the University of Alberta, and are currently stored in a research-grade freezer at – 28°C. Research thus far has focused on determining the level of terrestrial contamination of these pristine samples through analysis of soluble organic molecules [3]. Results are used to establish protocols and define facility requirements for long-term curation and handling.

Results and Discussion

A description of the sample, and methods of organic molecule extraction and analysis are described in Hilts and Herd [3]. Ten of the 67 organic molecules identified are attributed to terrestrial contamination. The most prevalent contaminant is oleamide, a plasticizer used in the manufacture of Ziploc (and other) bags. Of the indigenous samples, several (such as naphthalene and styrene) are relatively reactive or volatile, which argues for need for cold curation of this sample in order to preserve organic compounds over the long term [3].

In addition to the presence of organic contaminants, macroscopic evidence of terrestrial contamination has been observed: some pristine samples were collected and wrapped in Al foil, which has reacted with the sample surface. The nature of this reaction is under investigation, along with the potential for organic molecule contamination by this collection method. The masses of other Tagish Lake samples vary dramatically with room temperature and humidity [4]. As a result of these observations, we envision a facility in which samples are stored in Teflon jars, and manipulated and subsampled at low temperature (– 20 °C to – 30 °C) in a glove box charged with ultrapure Ar.

[1] Grady *et al.* (2002) M&PS **37**, 713-735. [2] Hildebrand *et al.* (2006) M&PS **41**, 407-431. [3] Hilts and Herd (2008) *LPSC* **XXXIX**, Abstr. #1737. [4] McCausland, pers. comm.