



Behavior and mechanism of Cd(II) adsorption on loess-modified clay liner

Qinglei Yang^{a,*}, Jinli Zhang^a, Qing Yang^a, Yongxian Yu^b, Gang Yang^a

^a*School of Civil and Hydraulic Engineering and the State Key Laboratory of Coastal and Offshore Engineering, Dalian University of Technology, Dalian 116024, PR China*

Tel. +8613942855624; Fax: +8641184708511; email: qingleiyang@yahoo.com.cn

^b*Department of Chemistry, School of Chemical Engineering, Dalian University of Technology, Dalian 116024, PR China*

Received 7 July 2010; Accepted 31 August 2011

ABSTRACT

Cadmium is a toxic heavy metal which is common in landfill leachate and it has caused serious public health problems. It is necessary to find a cost effective method to deal with landfill leachate containing Cd(II). The loess-modified clay is proved to be effective to remove Cd(II) removal from landfill leachate. The adsorption capacity of loess-modified clay towards Cd(II) has been determined to be about 7.08 mg/g. Factors affecting the adsorption of Cd(II) include loess proportion, slurry concentration, initial solution pH, temperature and event duration. The adsorption isotherms and kinetic data are well fit with the Langmuir model and pseudo-second order kinetics model, respectively. The thermodynamic behavior reveals that the adsorption process is spontaneous and endothermic and the system disorder increases with time. The adsorption of Cd(II) on loess-modified clay involves chemical reaction and surface complexation with clay minerals. Chemical precipitation is considered as the dominant mechanism at pH>9. Further studies using X-ray diffraction, Fourier transform infrared spectra have confirmed the adsorption mechanism. The material used in this paper is economic and environmental protection, which is proved to be appropriate for landfill liner material.

Keywords: Adsorption; Loess-modified clay; Cadmium; Kinetics; Isotherm; Thermodynamics; Landfill liners

*Corresponding author.