quite different. Surface areas ranged from 0.4–15.7 m^2/g. Surface chemical composition ranged from 0.8–38.5% Cl, 4.2–51.9% Si, and 0.1–1.1% Cu as examples. Bulk chemical analysis roughly tracked the surface analysis and again showed great variety. These observations were reinforced by SEM photos which showed that each sample was recognizably different, some looking like platelets, smooth spheres, or rough agglomerates.

Our dioxin analysis includes extraction in a soxhlet using toluene, purification in acid/base columns, and analysis in a GC/MS. The extraction and purification steps have all been done and the GC/MS concentrations will be presented with this paper. Any correlations of dioxin concentration with fly-ash properties will be presented.

Selective removal of metals from waste streams

Mark A. Fletcher and A. Akgerman

Department of Chemical Engineering, Texas A&M University, College Station, TX 77843-3136 (USA)

Abstract

Industrial wastewater contains high concentrations of metals such as copper, chromium, nickel, and zinc. It is desirable to recover each metal separately to allow recycling of metals and to satisfy waste minimization requirements. Metals can be selectively removed from aqueous solutions by chelation, since chelation of individual metals is controlled by pH. Research was undertaken to determine the parameters of the extraction of copper, chromium (III) and (VI), nickel, and zinc with two chelating agents, dithizone and Aliquat 336. The chelation reaction must be performed in a pH-buffered solution to maintain a constant pH. The percentage extraction of copper, nickel, and zinc with dithizone was measured at several pH values. The optimum pH for extraction of copper was pH 1, the optimum pH for extraction of zinc was pH 4, and the optimum pH range for extraction of nickel was pH 7–8. At pH 1 copper was selectively extracted from zinc and nickel by dithizone based on differences in

the reaction equilibria. Zinc was selectively extracted from nickel by dithizone at pH 4.70 based on differences in the reaction rates. The average apparent reaction rate constant of the nickel-dithizone reaction was 3.22×10^{-7} min^{-1}. The average apparent reaction rate constant of the zinc-dithizone reaction was 1.92×10^{-2} min^{-1}. The copper–dithizone reaction was too fast to measure the apparent reaction rate constant. The equilibrium distribution constants of copper, nickel, and zinc between dithizone and an aqueous phase were measured. The results of this research will be utilized to design a process to selectively recover metals from wastewater.

Soil–air fluxes of hazardous substances at treatment, storage, and disposal facilities: Models and measurements

A.R. McFarland and P.N. Murthy

Department of Chemical Engineering, Texas A & M University, College Station, TX 77843-3136 (USA)

and

S.A. Batterman

Department of Chemical Engineering, University of Michigan, Ann Arbor, MI 48109-2029 (USA)

Abstract

Research has focused on the transport of VOCs in soils and the subsequent emissions to the atmosphere which occur at sites contaminated with hazardous substances. Four areas are being investigated: (1) modeling of VOC transport through the vadose zone, (2) development of a new sampling approach for determining the flux of VOCs at the soil–air interface, (3) determination of sorption and other transport parameters for contaminants in the unsaturated zone, and (4) development of an air sampler to collect and size fractionate wind blown dusts at hazardous waste sites. Work in the first area has led to a numerical model which simulates contaminant transport. Work in the second area has led to a flux sampler which has been both field and laboratory tested. Apparatus has been developed for conducting research in the third area and that apparatus is currently being evaluated. Wind tunnel tests are currently