Change in batch kinetics of phenol biodegradation due to changes in the physiological state of the bacteria and the initial amount of phenol fed

Mehmet S. Okaygun and Aydin Akgerman

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

Abstract

Phenol biodegradation was studied using acclimated activated sludge at two different physiological states of the bacteria: (1) the bacteria were starved (feeding frequency was once per two days) and (2) the bacteria were continuously fed in the batch mode (feeding frequency was once per 6–7 hours). Phenol was used as the sole carbon source. During the batch experiments, the phenol concentration and the total suspended solids were measured continuously. It was shown that the kinetics of phenol biodegradation changed from Monod to Haldane as the feeding frequency increased. In batch studies with very high initial phenol concentration, although the bacteria were starved, the bacterial growth was inhibited at the beginning of the batch study. All of the data were obtained by using mixed sludge from one specific reactor which had the same culture history. The microbial populations were analyzed both when they were starved and were continuously fed in the batch mode. There were not any microbial shifts in the microbial species at the two different states. Therefore, the change in the batch kinetics of phenol biodegradation was due to two reasons: the change in the feeding frequency and the initial amount of phenol fed to the bacteria. It was also shown that the sludge yield may not stay constant during a batch study irrespective of the feeding frequency.

Characteristics of metal capture during fluidized bed incineration of waste contaminated with lead nitrate

T.C. Ho, L. Tan, C. Chen and J.R. Hopper

Department of Chemical Engineering, Lamar University, P.O. Box 10053, Beaumont, TX 77710 (USA)

Abstract

The emission of toxic metals during the incineration of solid wastes contam-

inated with metals presents a potential health hazard to human beings. One of the novel control technologies for heavy metal emissions is the capture of metals during incineration.

The objective of this work was to study experimentally the characteristics of metal deposition on bed particles during fluidized bed incineration of solid wastes contaminated with heavy metals. Experiments were carried out in a 7.62 cm laboratory-scale fluidized bed of sand and aluminum oxide. Artificial test materials contaminated with lead were prepared and incinerated in the bed with different sorbents under different operating conditions. An atomic spectrometer was employed to measure the lead concentration in the original test material and sorbent, the incinerated bottom ash, and the fly ash. The characteristics of metal deposition on sorbent under specific operating conditions were evaluated.

Chemical oxidation of woodtreating waste

Chang Hai Kuo

Department of Chemical Engineering, Mississippi State University, P.O. Drawer CN, Mississippi State, MS 39762 (USA)

Abstract

This research deals with the detoxification of woodtreating wastes by chemical oxidation using ozone and/or hydrogen peroxide as oxidizing agents. The major goal is to develop effective technologies and optimum schemes for on-site treatment of wood preserving facilities, groundwater and soils contaminated by the hazardous pollutants.

Experimental results indicated that in the aqueous phase, ozone is very reactive with the major constituents, pentachlorophenol (PCP), *o*-, *m*- and *p*-cresol, of the woodtreating wastes. For some experiments carried out in a stirred-tank reactor, samples were withdrawn periodically to determine changes in the concentration of ozone by titration method. The dissolved ozone depleted rapidly in the first few minutes of a reaction and the reaction half-life was less than a few minutes. This high reactivity of ozone with cresols and PCP oc-