Reductive Dechlorination of Carbon Tetrachloride by Microscale Sponge Iron

*Xueqiang ZHU[1], Baoping Han[2], Qiyan Feng[1]

1. China University of Mining and Technology, 2. Jiangsu Normal University

Chlorinated hydrocarbons are the most prevalent groundwater pollutants that pose a risk to public health. The degradation of CCl_4 by sponge iron and factors affecting degradation efficiency including acid washing, dosage and initial pH were investigated through batch experiments in this study. Results showed that CCl_4 was effectively degraded by sponge iron and about 75 percent of CCl_4 was transformed into chloroform (CF) by hydrogenolysis process. The rate of CF transformation was slower than that of CCl_4, resulting in the CF accumulation. Surface acid activation showed slight influence on CCl_4 degradation with ZVI. The CCl_4 degradation reactions followed pseudo-first-order kinetics, and the apparent first-order rate constant (k_{obs}) increased linearly with increasing ZVI dosage and the suitable dosage of 20g/L was indicated in terms of surface area-normalized rate constants (k_{SA}). The k_{obs} decreased with the increasing of pH value and the process indicated that the degradation of CCl_4 had a better performance under weak acidic condition.

Keywords: Carbon tetrachloride, Sponge iron, Reductive dechlorination

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