Insights into the role of humic acid on Pd-catalytic electro-Fenton transformation of toluene in groundwater

Peng Liao, **Yasir Al-Ani**, Zainab Malik Ismael, Xiaohui Wu

Abstract

A recently developed Pd-based electro-Fenton (E-Fenton) process enables efficient in situ remediation of organic contaminants in groundwater. In the process, H2O2, Fe(II), and acidic conditions (,pH 3) are produced in situ to facilitate the decontamination, but the role of ubiquitous natural organic matters (NOM) remain unclear. This study investigated the effect of Aldrich humic acid (HA) on the transformation of toluene by the Pd-based E-Fenton process. At pH 3 with 50 mA current, the presence of HA promoted the efficiency of toluene transformation, with pseudo-first-order rate constants increase from 0.01 to 0.016 as the HA concentration increases from 0 to 20 mg/L. The HA-enhanced toluene transformation was attributed to the accelerated thermal reduction of Fe(III) to Fe(II), which led to production of more hydroxyl radicals. The correlation of the rate constants of toluene transformation and HA decomposition validated hydroxyl radical (?OH) as the predominant reactive species for HA decomposition. The finding of this study highlighted that application of the novel Pd-based E-Fenton process in groundwater remediation may not be concerned by the fouling from humic substances.