

Reduction of Nitrite and Nitrate on Nano-dimensioned FeS

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Abstract The reaction of nitrite (NO_2^-) and nitrate (NO_3^-) on nanometer-sized FeS particles was investigated in alkaline (initial pH=10.3) solutions at reaction temperatures of 22, 70, and 120 °C using in situ attenuated total reflection Fourier transform infrared spectroscopy (ATR-FTIR) and fluorescence spectroscopy that allowed an analysis of adsorbate complexation on the FeS and reaction product in the aqueous phase, respectively. ATR-FTIR showed that NO was a surface-bound intermediate on FeS during its exposure to NO_2^- at all three reaction temperatures. Ammonia/ammonium ($\text{NH}_3/\text{NH}_4^+$) product was also produced when FeS was exposed to NO_2^- at the 70 °C and 120 °C reaction temperatures. Activation of NO_3^- to form surface-bound NO was experimentally observed to occur at 120 °C on FeS, but not at the lower reaction temperatures. Furthermore, $\text{NH}_3/\text{NH}_4^+$ product in the aqueous phase was only present during the reaction of FeS with NO_3^- at the highest temperature used in this study.

Keywords Nitrite · Nitrate · Attenuated total reflection Fourier transform infrared · Ammonium formation

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