

Effect of Residence Time on Ni-Sorption Mechanisms on Clay and Oxide Minerals: An X-ray Absorption Fine Structure (XAFS) Study

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Metal sorption on clay and oxide minerals is typically fast initially, then the rates gradually diminish. In the literature the decline in reaction rate has been attributed to metal sorption onto sites of lower reactivity, diffusion of the adsorbate into the adsorbent or by a precipitation reaction. We investigated the effect of reaction time on the surface coordination environment of Ni sorbed onto clays and aluminum oxides using XAFS spectroscopy. The kinetics were studied over a long reaction period (minutes to months) and changes in the XAFS spectra were monitored. As reaction time progressed, surface precipitates increasing in size were depicted. Derived structural parameters are similar to those in mixed Ni/Al hydroxides, thus suggesting the presence of a Ni phase of similar structure. This finding illustrates the importance of considering secondary precipitate formation when metals sorb on surfaces of clay and aluminum oxides.