Iron Oxide Morphology and Composition as Possible Indicators of Sedimentary Redox Cycling

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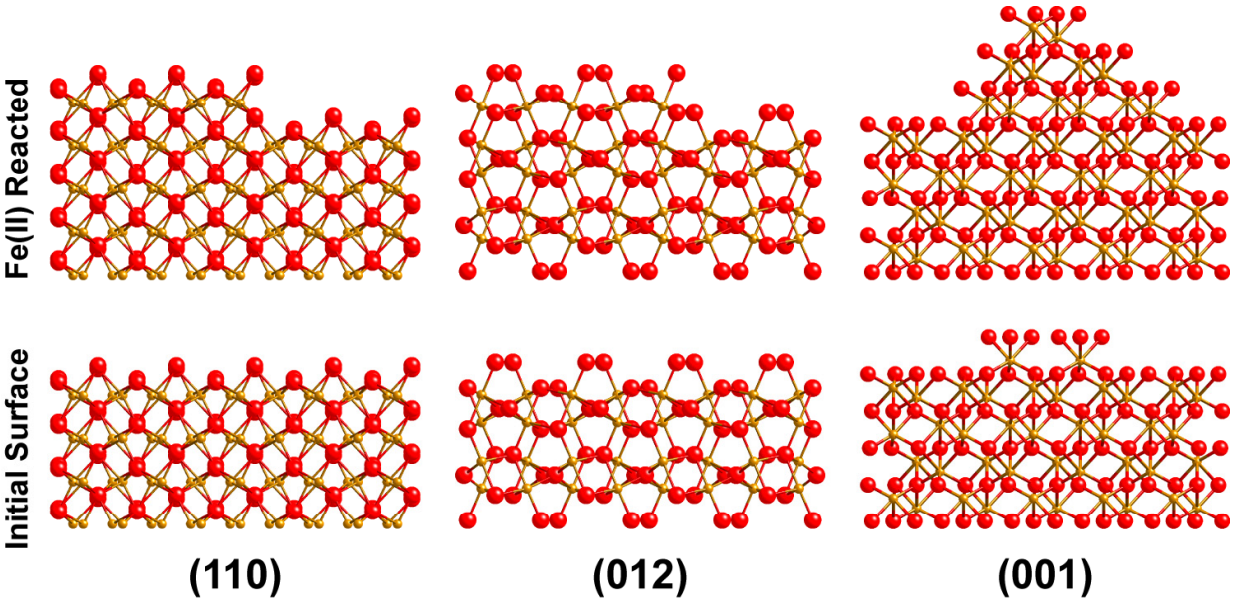
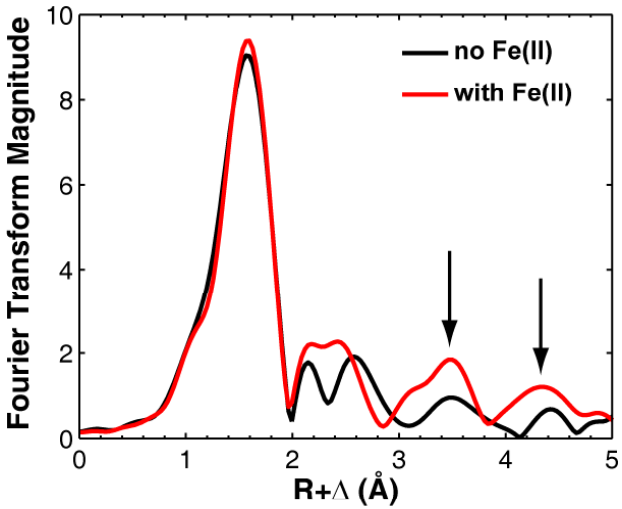


Schematic models illustrating the transformations of hematite surfaces induced by reaction with Fe(II)



Fourier transform EXAFS spectra showing additional neighboring Fe atoms (arrows) after Fe(II) reaction, indicating structural incorporation

Fe(II) induces nanometer-scale structural transformations of hematite surfaces at both acidic and neutral pH conditions. These transformations vary with orientation and suggest growth and dissolution are each localized on distinct surfaces. Such nanometer-scale transformations also lead to Ni(II) incorporation into the hematite structure. Together, these observations suggest that sedimentary redox cycling may leave tell-tale morphological and compositional signatures in iron oxides minerals.