Evolution of Hematite Surface Microtopography Upon Dissolution by Simple Organic Acids

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Abstract: The surface microtopography of hematite over the course of dissolution in oxalic and citric acids was examined by *in-situ* and *ex-situ* atomic-force microscopy, *In-situ* imaging of the basal-plane surface of a centimeter-scale natural hematite sample immersed in 2 mM citric acid demonstrated that the basal-plane surface was relatively unreactive; rather, dissolution occurred along step edges and via etch-pit formation. *Ex-situ* imaging of synthetic hematite particles following batch dissolution in 1 mM oxalic acid showed similar dissolution features on basal-plane surfaces; in addition, etching along particle edges was apparent. The presence of etch features is consistent with a surface-controlled dissolution reaction. The results are in agreement with previous investigations suggesting that the basal-plane surface is relatively unreactive with respect to ligand exchange. Both *in-situ* and *ex-situ* imaging of particle surfaces can provide valuable information on the roles of surface structures and microtopographic features in mineral dissolution.

Key Words: Atomic force microscope • Clay mineral surfaces • Dissolution • Hematite • Organic acids

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