# Relation of Infrared, Crystallochemical, and Morphological Properties of Al-Substituted Hematites

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**Abstract:** Synthetic Al-hematites prepared from ferrihydrites, at low (~ 100 ° C) and high (400 ° and 800 ° C) temperatures were studied for their morphological, crystallochemical, and infrared (IR) characteristics. Low-temperature Al-hematites had a platy morphology (the plate thickness was inversely related to amount of Al substitution), and the high temperature Al-hematites showed a poorly defined morphology due to interparticle sintering. In the low-temperature Al-hematites shifts in the IR mode frequencies were noted and could be partly explained by a shape factor that was deduced from particle morphology. The intrinsic effect of Al substitution, however, was to produce shifts of as much as $10-15\ cm^{-1}$ for the highest Al substitution (~ 16%). Similar shifts were observed for the high-temperature hematites in which morphology was not appreciably affected by Al substitution.

**Key Words:** Aluminum • Hematite • Infrared spectroscopy • Iron oxides • Morphology • Unit-cell parameters

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