
Influence of Al Substitution and Crystal Size on the Room-Temperature Mössbauer Spectrum of Hematite

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Abstract: Mössbauer spectra of 15 hematites with Al substitutions between 0 and 10 mole % were taken at room temperature. X-ray powder diffraction indicated dimensions of these hematites in the *c*-direction to range upwards from 27 nm to crystals large enough to show no line broadening. The Mössbauer spectra showed that magnetic hyperfine fields decreased both with increasing Al-for-Fe substitution and with decreasing crystal size. These relationships indicate that hyperfine field variations cannot, as has been done in the past, be unequivocally related to Al substitution alone. Hyperfine field reductions were paralleled by Mössbauer line broadening due to hyperfine field distributions. Only the hematites heated to 1000° C showed a significant variation of quadrupole splittings with Al substitution. No dependence of quadrupole splitting on crystal size was observed, indicating no detectable distortion of coordination polyhedra in the particle size range studied.

Key Words: Aluminum • Hematite • Iron • Mössbauer spectroscopy • Particle size

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