

Electron Spin Resonance Study of α -Cr₂O₃ and Cr₂O₃ · nH₂O Quasi-Spherical Nanoparticles

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ABSTRACT

The quasi-spherical nanoparticles of hydrated Cr₂O₃ · nH₂O, and crystalline α -Cr₂O₃, have been synthesized by reduction of the first row (3d) transition metal complex of K₂Cr₂O₇. The temperature dependence of electron spin resonance (ESR) spectrum was studied in terms of g-factor, line width and intensity. ESR of both Cr₂O₃ · nH₂O and α -Cr₂O₃ has been studied at X-band (9.61 GHz) in the temperature range of 292–420K. An anomalous thermal hysteresis was observed in the ESR intensity and linewidth (ΔH_{pp} of Cr₂O₃ · nH₂O). This study shows that there could be a dominant water loss/gain during the heating-cooling cycles which is influencing the thermal relaxation time of Cr₂O₃ · nH₂O. A similar hysteresis was observed in the differential scanning calorimetry (DSC) data which correlates well with that of ESR indicating possible surface dehydration/rehydration of Cr₂O₃ · nH₂O nanoparticles during the heating–cooling cycles of ESR measurements.