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Program
CRYSTALLOGRAPHIC AND MÖSSBAUER STUDIES of CoFeCrO₄

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CoFeCrO₄ has been studied with x-ray diffraction, Mössbauer spectroscopy. The crystal structure is found to be a cubic spinel with the lattice constant a₀ = 8.381 Å. Mössbauer spectra of CoFeCrO₄ have been taken at various temperatures ranging from 12 K to 350 K. The isomer shift indicates that the iron ions are ferric and located at the tetrahedral [A] sites. The Curie temperature is determined to be Tₑ = 310 K. As the temperature increases toward Tₑ, a systematic line broadening effect in the Mössbauer spectrum is observed and interpreted to originate from different temperature dependencies of the magnetic hyperfine fields at various iron sites. Also, by using binomial distribution equation we obtained the hyperfine fields of tetrahedral sites, Hₑ(A₂) = 525 kOe, Hₑ(A₁) = 516 kOe, Hₑ(A₃) = 508 kOe, Hₑ(A₄) = 499 kOe, Hₑ(A₅) = 490 kOe, Hₑ(A₆) = 481 kOe, Hₑ(A₇) = 472 kOe, Hₑ(A₈) = 496 kOe at 16 K. The Debye temperatures for the A site of CoFeCrO₄ are found to be θₑ = 239 ± 5 K. The average hyperfine field Hₑ(T) of the CoFeCrO₄ shows a temperature dependence of [Hₑ(T)-Hₑ(0)]/Hₑ(0) = -0.41(T/Tₑ)² + 0.14(T/Tₑ) - 0.7, indicative of spin-wave excitation.

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