

Structural and Magnetic Properties of Cu-Substituted Magnetite Studied by Using Mössbauer Spectroscopy

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Slowly cooled $\text{Cu}_x\text{Fe}_{3-x}\text{O}_4$ ($x = 0.2, 0.3$) has been investigated over a temperature range from RT to 700 K by using the Mössbauer technique. After the samples are annealed under vacuum at 450 °C for half an hour, Mössbauer spectra reveal the conventional magnetite pattern with an additional hematite pattern. The ratios of the hematite intensity to the total intensity in the Mössbauer spectra for $x = 0.2$ and $x = 0.3$ are 21 and 31 %, respectively. These hematite ratios may be due to annealing under vacuum at 450 °C, which transforms Cu^{2+} ionic states into Cu^{1+} . If the charge neutral condition is applied to the magnetite phase of the annealed sample, the Cu^{1+} -substituted magnetite with a single-phase cubic spinel structure is produced.

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