

Raman spectroscopy of Cu doping in $\text{Zn}_{1-x}\text{Co}_x\text{O}$ diluted magnetic semiconductor

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Abstract: The room-temperature ferromagnetism and the Raman spectroscopy of the Cu-doped $\text{Zn}_{1-x}\text{Co}_x\text{O}$ powders prepared by the sol-gel method are reported. The x-ray diffraction (XRD) data confirmed that the wurtzite structure of ZnO is maintained for ZnO doped with Co below 10 at%. The magnetization-field curves measured at room temperature demonstrated that all Co-doped ZnO powders were paramagnetic. Ferromagnetic ordering is observed for the samples doped with Cu in $\text{Zn}_{0.98}\text{Co}_{0.02}\text{O}$ and strongly depends on the concentration of Cu. The relative strength of the second-order LO peak to the first-order one in the Raman spectra, which is related to the carrier concentration, of the Cu-doped $\text{Zn}_{0.98}\text{Co}_{0.02}\text{O}$ powder is strongly correlated with the saturation magnetic moment of the system. This seems to be in favor of the Ruderman-Kittel-Kasuya-Yosida (RKKY) or double exchange mechanism of the ferromagnetism in this system. ?? 2009 John Wiley & Sons, Ltd.

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