

Structure and optical properties of transparent cobalt-doped ZnO thin layers

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List of Figures

Figure S1. Temperature dependence of resistance for ZnO:Co layers annealed at two temperatures (250 °C and 300 °C).

Figure S2. SEM image of the ZnO:Co layer annealed in temperature 300 °C

Figure S3. EDS analysis of the ZnO:Co

Table T1. EDS analysis of ZnO:Co

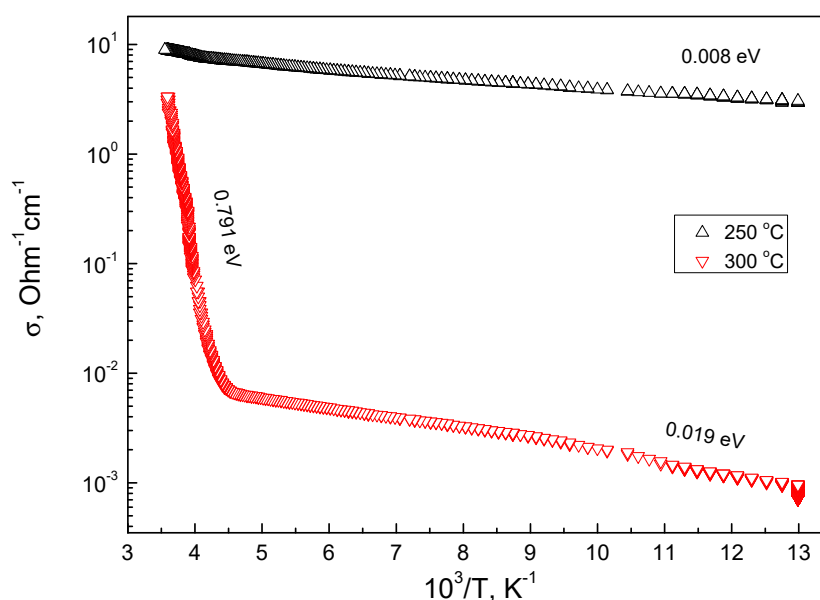


Figure S1. Temperature dependence of resistance for ZnO:Co layers annealed at two temperatures (250 °C and 300 °C).

Figure S1 shows the measured temperature dependence of resistance for ZnO:Co layers annealed in air.

The measurement was performed in the temperature range from room temperature, to the temperature of liquid nitrogen (77 °K). The specific conductivity (σ) was calculated. A characteristic dependence was found for semiconductors. For the layer annealed at 250 °C there is a shallow level of 0.008 eV. After annealing at 300 °C, there are two levels, 0.019 eV (the nature of this level is certainly the same as for the layer annealed at 250 °C) and a deep level of 0.791 eV (near room temperature). The resistance of the samples with increasing annealing temperature grows slightly, from a value of about 10 k Ω to about 50k Ω . In the low-temperature region of the measurements, we observe an increase in resistance to about 100 M Ω .

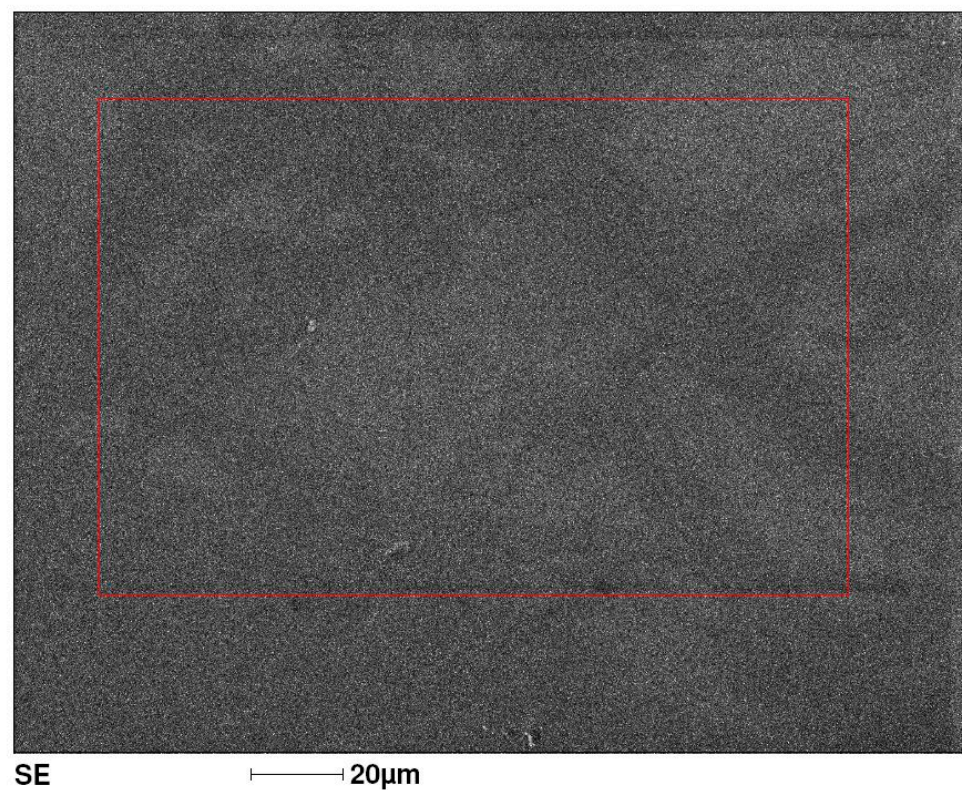


Figure S2. SEM image of the ZnO:Co layer annealed in temperature 300 °C

A SEM/FIB Quanta 3D 200i dual beam microscope was used to obtain the scanning electron microscope (SEM) images. SEM images of the $\text{Zn}_{0.8}\text{Co}_{0.2}\text{O}$ film is presented in Figure S2. There are no practically visible inclusions and inhomogeneities in the image. The red box is the area where the EDS measurement was made.

Figure S3 and Table S1 show the results of the EDS analysis.

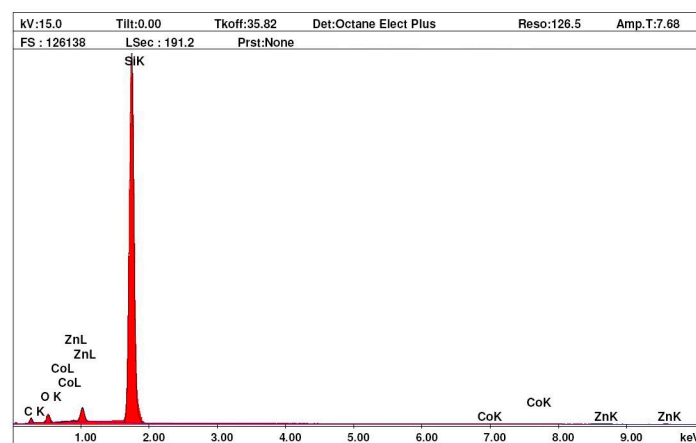


Figure S3. EDS analysis of the ZnO:Co

Table S1. EDS analysis of ZnO:Co

Peak	%wt	at%
C	9.65	19.94
O	2.23	3.60
Si	86.21	75.9
Co	0.28	0.11
Zn	1.54	0.45