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**Post-annealing structural rearrangement of M/CuO<sub>x</sub> (M=Ag, Au) nanocomposite thin films showing Localized Surface Plasmon Resonance.**

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In this contribution, we describe the structural modifications that occur in M/CuO<sub>x</sub> (M=Ag, Au) nanocomposite thin films after annealing at different temperatures. Films are deposited by reactive magnetron sputtering of a Cu target doped with different amounts of Au and/or Ag pellets. The characteristics of the films are evaluated by X ray diffraction (XRD), Rutherford backscattering spectrometry (RBS) and X-ray photoelectron spectroscopy (XPS).

It is observed that 'as deposited' thin films are homogeneous in depth, and relatively amorphous. In contrast, the formation of CuO and precipitation of noble metals is observed by XRD after annealing. The net gain of oxygen atoms in the film can be precisely measured by RBS, while the quantity of the other elements remains constant. In addition, the concentration of Ag and/or Au near the film surface is dramatically reduced. Further, it is verified that the in-depth homogeneity of the films is broken, leading to 'layered' structures different for Ag- and Au- containing films. Interestingly, films doped with both Au and Ag resembles those containing Au. All these results are described in detail and interpreted considering the diffusional behavior of the different elements of the films. The correlation with the observed optical behavior is also discussed.

**Keywords**

plasmonic  
annealing  
CuO  
Ag  
Au