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# Effect of the composition on the thermal stability of sputtered copper-platinum oxide films

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Bulk copper-platinum oxides ($Cu_{1-x}Pt_xO$) crystallise in a PtS-like structure ($P4_2/mmc$) in which platinum and copper atoms are randomly substituted. In the literature, this oxide can be formed when x is ranging between 0.135 and 0.355. Sputtering processes are well-known to extend the composition range of materials compared to that reported in the phase diagrams. In this presentation, we intend to show that the composition range of copper-platinum oxides can be extended using the reactive co-sputtering process and to study the thermal stability of the deposited films.
Cu-Pt-O films were deposited on glass substrates using the co-sputtering of copper and platinum targets in $Ar-O_2$ reactive mixtures. The copper content in the deposited films was adjusted by varying the current applied to the copper target while that applied to the platinum target was kept constant. The Cu/Pt atomic ratio was estimated using X-ray energy dispersive spectrometry. The film structure was studied using X-ray diffraction (XRD). The thermal stability of Cu-Pt-O films was investigated after air annealing at temperature ranging between 450 and 550 °C.
As-deposited copper-free films are X-ray amorphous. The same is true for $Cu_{1-x}Pt_xO$ films when x is higher than 0.6. The PtS-like structure is evidenced by XRD in Cu-Pt-O films when x is ranging between 0.25 and 0.6, confirming that the sputtering process allows the deposition of films with extended composition range. Air annealing of copper-free films comes with the formation of metallic platinum and platinum oxide. On the other hand, the PtS-like structure is thermally stable after a 550 °C air annealing treatment when x is ranging between 0.45 and 0.6. For higher values of x, the films decompose into CuO and Pt. Finally, the effect of the annealing treatment on the electrical and optical properties of Cu-Pt-O films is discussed in connection with their structure evolution.

**Keywords**
REactive sputtering
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oxides