

PO2018

## Mechanical and tribological properties of magnetron sputtered Sn-Cu-O films

Martin Hromadka<sup>1</sup>, Jindrich Musil<sup>1</sup>, Radomir Cerstvy<sup>1</sup>, Zbynek Soukup<sup>1</sup>

<sup>1</sup>University of West Bohemia, Plzen, Czech Republic

[martinh@kfy.zcu.cz](mailto:martinh@kfy.zcu.cz)

The paper reports on mechanical and tribological properties of Sn-Cu-O thin films reactively sputtered in an Ar+O<sub>2</sub> mixture using a round magnetron. The magnetron is equipped with a Sn/Cu target composed of Sn plate ( $\varnothing=100$  mm) fixed to the magnetron cathode by a Cu ring of inner diameter  $\varnothing_{in}$ . The content of Cu in the Sn-Cu-O film was controlled by  $\varnothing_{in}$ . The effect of Cu addition in the Sn-Cu-O oxide and the substrate temperature  $T_s$  used in the film deposition on the structure, mechanical (hardness  $H$ , effective Young's modulus  $E^*$ , elastic recovery  $W_e$ ) and tribological (coefficient of friction  $\mu$ , wear rate  $k$ ) properties of Sn-Cu-O film were investigated in detail. It was found that (i) the Sn-Cu-O films deposited at  $T_s=500^\circ\text{C}$  exhibit much higher hardness ( $H$  up to 19 GPa) compared to those deposited on unheated substrates ( $H \approx 10$  GPa), (ii) all Sn-Cu-O films deposited under very different deposition parameters exhibit a low wear rate (down to  $\sim 2 \times 10^{-7}$  mm<sup>3</sup>/Nm), (iii) increase in relative humidity of operation atmosphere used in tribological test decreases the coefficient of friction from  $\sim 0.7$  (10%) to  $\sim 0.4$  (87%). The values of  $\mu$  and  $k$  were measured at room temperature (RT). The values of  $\mu$  and  $k$  measured at temperatures  $T > \text{RT}$  up to  $500^\circ\text{C}$  will be also presented.

### Keywords

Sn-Cu-O films

Structure

Mechanical properties

Tribological properties

Reactive magnetron sputtering