

Adhesion of Sputtered Copper Thin Films Deposited on Flexible Substrates

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Abstract : Adhesion of copper thin films deposited on polyethylene terephthalate substrate by direct current sputtering with different sputtering parameters is discussed in this work. The effects of plasma treatment with 0, 5, and 10 minutes on the thin film properties are investigated first. Various argon flow rates at 40, 50, 60 standard cubic centimeters per minute (sccm), deposition power at 30, 40, 50 W, and film thickness at 100, 200, 300 nm are also discussed. The 3-dimensional surface profilometer, micro scratch machine, and optical microscope are used to characterize the thin film properties. The results show that the increase of the plasma treatment time on the polyethylene terephthalate surface affects the roughness and critical load of the films. The critical load increases as the plasma treatment time increases. When the plasma treatment time was adjusted from 5 minutes to 10 minutes, the adhesion increased from 8.20 mN to 13.67 mN. When the argon flow rate is decreased from 60 sccm to 40 sccm, the adhesion increases from 8.27 mN to 13.67 mN. The adhesion is also increased by the condition of higher power, where the adhesion increased from 13.67 mN to 25.07 mN as the power increases from 30 W to 50 W. The adhesion of the film increases from 13.67 mN to 21.41mN as the film thickness increases from 100 nm to 300 nm. Comparing all the deposition parameters, it indicates the change of the power and thickness has much improvement on the film adhesion.

Keywords : flexible substrate, sputtering, adhesion, copper thin film

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