ORF104

HiPIMS with positive pulses as a new tool to tailor film properties

Ivan Fernandez[1], Ambiorn Wennberg[2], Jose Antonio Santiago Varela[3]

[1]NANO4ENERGY SL, MADRID, Spain [2]Nano4Energy SL, MADRID, Spain [3] Nano4energy SL, MADRID, Spain

IVAN.FERNANDEZ@NANO4ENERGY.EU

Recently, it has been demonstrated that the addition of a positive voltage pulse adjacent to the negative HIPIMS sputtering pulse allows the increase of film ion assistance and thus, the improvement of coating properties on both biased and insulating substrates.This study presents results of experiments conducted to further deepen the understanding how the shape of the positive pulse, such as delay, amplitude and length of the pulse, affects the deposition rate and film density, and in consequence, the resulting film properties. Some examples will be presented for different applications such as:

- Hard metal nitrides for cutting tools, molds and dies. The properties of AlTiN-based nitrides where the spinodal decomposition at higher Al contents is prevented.
- Trench filling for wafer packaging. Filling of deep trenches with metallic conductive layers is improved with the addition of positive pulses. Experiments were performed with 15:1 aspect ratio trenches.
- Increase on sp^3 contents in hydrogen-free diamond-like carbon coatings. Hardness up to 40GPa are achieved.
- Improved barrier properties of AlSiOx oxide layers on PET substrates for high-end transparent barrier applications. Tests were performed on an industrial web coater using rotatable magnetrons and reactive sputtering. Water vapour permeation tests were measured using the Mocon W-700 instrument.

Velicu et al., Surface & Coatings Technology 359 (2019) 97.
Britun et al., Appl. Phys. Lett. 112 (2018) 234103.Avino et al., Plasma Sources Sci. Technol. 28 (2019) 01LT03.
J.A.Santiago, I Fernandez-Martinez et al., Surface & Coatings Technology 358 (2019) 43.
Eichenhofer, I Fernandez-Martinez et al., UJPA 11(3), (2017) 73

Keywords
HiPIMS
Positive Pulse
Ionized deposition