PO3013

On the existence of a double S-shaped process curve during reactive magnetron sputtering

Roeland Schelfhout, Koen Strijckmans, Diederik Depla

Ghent University, Ghent, Belgium

Roeland.Schelfhout@UGent.be

Reactive DC magnetron sputtering is a common technique to deposit compound films. Starting from an elemental metal target, the composition on the substrate can be altered by adjusting the reactive gas flow. However, at given sputtering conditions, a transition in operating conditions is noticed at critical reactive gas flow rates inducing the well-known hysteresis effect during reactive sputtering. These inherent instabilities restrict the achievable substrate compositions or decrease the deposition rate substantially.
Reactive sputter deposition models simulating the hysteresis effect predict an S-shaped process curve of the discharge voltage and the reactive partial pressure as a function of the reactive gas flow. It can be demonstrated that this S-shape process curve causes the inherent instability under typical operating conditions. Therefore, modelling the S-shaped process curve yields important information on the influence of the operating variables on the hysteresis and on the parameters of interest.
Up till now, the experimentally and simulated S-shaped process curves were assumed to be unique for each specific system. However, we report the existence of a double S-curve during reactive sputtering implying that there are at least two different reactive gas flows corresponding to each reactive gas pressure at constant operating conditions.

Keywords
reactive sputttering
magnetron
hysteresis
aluminum