OR1203

Additional control of bombardment by using highly ionized fluxes of film forming species.

Joao Oliveira, Fabio Ferreira, Ricardo Serra, Filipe Fernandes, Albano Cavaleiro

SEG-CEMUC, University of Coimbra, Coimbra, Portugal

joao.oliveira@dem.uc.pt

In magnetron sputtering, the strength of the shadowing effect is primarily set by the geometry of the deposition system and, thus, the ability to tailor the properties of a thin film depends on the effective control of the bombarding species: flux, average energy and impinging angle distribution. Increasing the deposition pressure increases the gas phase collisions and, therefore, the low angle component of the angle distribution of the impinging species becomes stronger, i.e., the shadowing effect is enhanced. Bombarding the growing surface with argon ions extracted from the plasma (substrate biasing) is a commonly used method to counterbalance the shadowing effect. Additional control of the bombarding species can be obtained by ionizing the sputtered flux as the ions can be controlled with respect to their energy and impinging direction. High-power Impulse Magnetron Sputtering (HiPIMS) relies on the application of very high target power densities to achieve higher plasma densities and subsequent ionization of the sputtered material without the need for additional components in the deposition system. This work is the first part of a study aiming at evaluating the effectiveness of the DOMS technology (Deep Oscillations Magnetron Sputtering), a variant of HIPIMS, as a tool to improve the control of the bombarding species during magnetron sputtering. For this purpose metallic and nitride thin films were deposited by both DCMS and DOMS, in a wide range of deposition conditions leading to very different bombardments regimes. The structure, morphology, surface topography and mechanical properties of the films were characterized and related to the bombarding conditions. It was concluded that HIPIMS-DOMS allows using different sets of energy and incidence angle of the bombarding species as compared to DCMS and, therefore, enables the deposition of thin films with improved properties.

Keywords
Sputtering
HIPIMS
DOMS
Nitrides
Chromium