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INFLUENCE OF THE NATURE OF THE TRANSITION METAL IN OBLIQUE ANGLE DEPOSITION.

GROM - Thin film growth and modelling
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Abstract content

GLancing Angle Deposition (GLAD), also known as Oblique Angle Deposition (OAD), is a powerful technique for controlling the microstructure of thin films and, consequently, their properties [1]. This process relies on the orientation of the substrate relative to the vapor source and the resulting shadowing effect that occurs during growth. This configuration produces films with inclined columns and increased porosity.

The Tait's rule and the tangent rule are the two models commonly used to correlate the column tilt angle with the incidence angle. While the column tilt angle is typically obtained through SEM cross-sectional observations, the incidence angle can be easily calculated using numerical simulations, such as SIMTRA [2]. However, these models do not account for the chemical nature of the deposited material, including atomic mass and crystalline structure.

In this study, we investigate the deposition of nine transition metals from three different groups: Ti, Zr, and Hf (hcp structure), Cr, Mo, and W (bcc structure), and Cu, Ag, and Au (fcc structure). The surface morphologies and columnar microstructures are analyzed and discussed. An emphasis is put on the prediction of column tilt angle related to the deposition angle facing simulated and experimental architectures. A classification of these sputter-deposited metals is even suggested as function of their crystalline structure, and atomic number in periods and groups.

References

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Colum tilt angle vs. incidence angle