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On the deposition rate during High-Power Impulse Magnetron Sputtering.

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High-Power Impulse Magnetron Sputtering (HiPIMS) allows the synthesis of thin films with enhanced properties [1]. During HiPIMS, the sputtered materials are ionized leading to ion assisted film growth. However, this technology has a major drawback: the deposition rate in HiPIMS is only a fraction of the one measured during conventional DC magnetron sputtering processes, at the same average power due to self-sputtering and the sub-linear dependence of the sputtering yield on the target potential [2].
In the present case, we have measured the amount of material deposited (the deposition rate) by x-ray fluorescence. Any error that could be induced by the variation of the film densities during ion assisted film growth is prevented. In our study, the pulse duration and the peak target current are varied but the average power (300W) is kept constant. We have measured the deposition rate by utilizing different target materials (Ti, W, and Cu) in the same working conditions and compared the results with TRansport of Ions in Matter (TRIM) simulations. Our data would confirm that the sputtering wind, which induces a transition from sputtering by background gas ions to the self-sputtering regime, leads to the decrease of the deposition rate. Apparently, the effect of self sputtering is quite pronounced for copper. From the obtained results, pathways to overcome the decrease of the deposition rate are suggested.
Keywords :
High Power Impulse Magnetron Sputtering, deposition rate
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