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# XPS investigation of Ar implantation in magnetron targets during high power pulsed magnetron sputtering processes.

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Magnetron sputtering is a widely used plasma-based deposition technique in which material is sputtered from a target by impact from noble gas ions produced in a glow plasma. One consequence often overlooked is that a fraction of the incoming noble gas ions is implanted within the target. Although noble gases will not form chemical bonds with the host matrix atoms, their electronic shells can nevertheless react to their environment according to different effects (compression of electronic orbitals, shielding by conduction band electrons in the host, etc.). We have already demonstrated [1] that the investigation of such implanted atoms by X-ray photoelectron spectroscopy (XPS) can provide information about their local environment; information which is related to the presence of defects in the matrix, crystallinity, or bubble formation, among other things. The nature of the defects induced in a magnetron sputter target due to the bombarding ions is directly related to the energy and amount of ions impacting the target, which in turn is directly determined by the plasma characteristics. High power pulsed magnetron sputtering (HiPIMS) is a relatively recent variation of magnetron sputtering, where the power is applied to the magnetron in short pulses, which results in the formation of very dense plasmas with a high fraction of ionized species. In this work, we investigate the Ar implanted in target electrodes during HiPIMS plasmas, with the goal to determine whether it is possible to extract information about the plasma conditions from the study of the sputtered target surface.
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[1] A. Rastgoo Lahrood, T. de los Arcos, M. Prenzel, A. von Keudell, and J. Winter, *Thin Solid Films* 520, 1625 (2011)

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