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Modeling of the Reactive High Power Impulse Magnetron Sputtering (HiPIMS) process JON TOMAS GUDMUNDSSON, University of Iceland, DANIEL LUNDIN, Université Paris-Sud, MICHAEL RAADU, NILS BRENNING, KTH Royal Institute of Technology, TIBERIU MINEA, Université Paris-Sud
— Reactive high power impulse magnetron sputtering (HiPIMS) [1] provides both a high ionization fraction of the sputtered material and a high dissociation fraction of the molecular gas. We demonstrate this through an ionization region model (IRM) [2] of the reactive Ar/O_2 HiPIMS discharge with a titanium target. We explore the influence of oxygen dilution on the discharge properties such as electron density, the ionization fraction of the sputtered vapor and the oxygen dissociation fraction. We discuss the important processes and challenges for more detailed modeling of the reactive HiPIMS discharge. Furthermore, we discuss experimental observations during reactive high power impulse magnetron sputtering sputtering (HiPIMS) of Ti target in Ar/N_2 and Ar/O_2 atmosphere. The discharge current waveform is highly dependent on the reactive gas flow rate, pulse repetition frequency and discharge voltage. The discharge current increases with decreasing repetition frequency and increasing flowrate of the reactive gas [3].

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[2] M. A. Raadu et al. Plasma Sources Sci. Technol. 20 (2011) 065007
[3] F. Magnus et al. J. Vac. Sci. Technol., 30 (2012) 050601

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