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Sputtering and evaporation mechanisms in magnetron process using a hot target

CAILLARD Amael, Robin GRAILLOT-VUILLECOT, Christophe CACHONCINLLE, Eric MILLON, Thomas LECAS, Anne-Lise THOMANN, Pascal BRAULT, Nadjib SEMMAR

GREMI CNRS/Univ Orléans, ORLEANS, France

amael.caillard@univ-orleans.fr

Disconnecting the target from the water cooled-magnetron is known to enhance the deposition rate especially for oxide thin film [1]. This also leads to the improvement of the thin film quality [2] that could come from the infra-red light emitted by the hot target [3]. Bleykher et al have recently proposed a model of heat and erosion processes [4-5]: they showed that the growth rate increase at high temperature is due to the evaporation of the hot target. In this model, the ions accelerated through the plasma sheath transfer kinetic energy to the target leading to its temperature rise. The target power is mainly released by radiative emission P_{rad} and species ejection (sputtering P_{sputt} and evaporation P_{evap}). We improved this model to take into account the temperature dependence of the sputtering mechanism/yield (issued from a molecular dynamic simulation [6]). The poster will present the whole model and the influence of the process parameters (as the power) on different parameters: temperature, P_{rad}, P_{sputt}, P_{evap}, atomic flux leaving the target and global power transferred to the substrate P_{sub}. Four metals will be investigated (Cu, Zn, Ti, Ni) having different saturated vapor pressures, sublimation temperatures, surface binding energies, heat capacities and thermal conductivities. Finally, the results will be compared to the experimental ones regarding the deposition rate and $P_{sub.}$

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