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Ability of conventional DC magnetron sputtering to coat complex substrates

Anne-Lise THOMANN[1], Constantin VAHLAS[2], Lyacine ALOUI[3], Eliane AMIN-CHALOUB[4], Amael CAILLARD[5], Eric MILLON[6], Pascal BRAULT[7], Mireille GAILLARD[6], Nadjib SEMMAR[8], Chantal BOULMER-LEBORGNE[6]

[1]GREMI / CNRS, Orléans Cedex2, France [2]CIRIMAT/INPT université de Toulouse, Toulouse cedex 4, France [3]CIRIMAT université de Toulouse, Toulouse cedex 4, France [4]GREMI / université d'Orléans, Orleans cedex 2, France [5]GREMI / CNRS, Orléans cedex 2, France [6]GREMI / université d'Orleans, Orleans cedex 2, France [7]GREMI / CNRS, Orleans cedex 2, France [8]GREMI / université d'Orléans, Orleans cedex2, France

anne-lise.thomann@univ-orleans.fr

Complex materials, exhibiting a cocktail of properties, are currently needed for many applications. In this context, new requirements arise in terms of materials processing, such as the coating and functionalization of complex surfaces of powders, porous materials, or micro-patterned devices. Depending on the requirements, the aim may be to duplicate the original design of the surface, or to modify it (filling of holes etc.).
Among available vapor deposition techniques (PVD and CVD), magnetron sputtering deposition exhibits advantages and drawbacks that it might be interesting to evidence. In that aim a micro-patterned silicon wafer has been designed in the frame of the french research group of laboratories named SurGéCo (CNRS GdR). Aluminum thin films have been deposited on this model substrate by two PVD techniques; pulsed laser deposition (PLD) and magnetron sputtering (MS), and by metal-organic (MO)CVD. Scanning electron microscopy (SEM) was performed in order to determine the film microstructure and thickness conformity. Besides the comparison between deposition techniques, the study of the film structure inside micro-holes or -trenches can give some insight into the deposition conditions.
To illustrate the ability of magnetron sputtering technique to coat complex surfaces, thin films of W, Ni and Ti deposited onto carbon nanotube carpets will be presented. These films are developed to serve as energy transducers for the characterization of the carpet thermal conductivity.

Keywords
Complex surface
Micro-patterned substrate
Carbon nanotube carpet
Plasma magnetron sputtering
Pulsed laser deposition