

## RESEARCH TOPIC FOR THE PARISTECH/CSC PHD PROGRAM

**Field:** *Materials Science, Mechanics, Fluids*

**Subfield:** Applied Physics, Mech. Eng.

**Title:** VACUITY: innoVative mAgnetron Cathode for modUlarly dePosITion sYstem

**ParisTech School:** Arts et Métiers Sciences et Technologies

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**Research group/Lab:** LaBoMaP

**Lab location:** Chuny, France

**(Lab/Advisor website):** <http://labomap.ensam.eu/>

### **Short description of possible research topics for a PhD:**

Magnetron sputtering is a PVD deposition technic that use material source, also called “targets”. These targets, whatever their number, are commonly planar and fixed (one can found cylindrical ones but the problematic remains the same). The size of these planar targets varies from few centimeter to few dozens, with rectangular or disc shapes. To ensure a correct deposition on complex substrates, these substrates undergo one or two-fold rotation in front of the static cathodes.

Based on numerical simulations work, the project aims to study the discretization of a large static planar target into numerous smaller ones, with a controlled position and orientation in the chamber. After the research and design work, this modulable target will be experimentally produced and tested in a real deposition system.

**Required background of the student:** Mechanical engineering, Material Science.

### **A list of 5 (max.) representative publications of the group:**

1. M. Evrard, A. Besnard, S. Lucas, Study of the influence of the pressure and rotational motion of 3D substrates processed by magnetron sputtering: A comparative study between Monte Carlo modelling and experiments, Surface and Coatings Technology 378,2019, 125070
2. B. Bouaouina, C.Mastail, A. Besnard, R. Mareus, F. Nita, A Michel, Nanocolumnar TiN thin film growth by oblique angle sputter-deposition: Experiments vs. simulations, Materials & Design 160, 2018, 338-349
3. A. Siad, A. Besnard, C. Nouveau, P. Jacquet, Critical angles in DC magnetron glad thin films, Vacuum 131, 2016, 305-311
4. D. Depla, A. Besnard, J. Lamas, The influence of the pressure on the microstructure of yttria-stabilized zirconia thin films deposited by dual magnetron sputtering, Vacuum 125, 2016, 118-122