

## Research Topic 16 for the ParisTech/CSC PhD Program

FOR APPLICATION, PLEASE CONTACT ADVISOR(S) BY EMAIL WITH COPY TO:

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**Subfield:** Applied Physics / Material Science / Mechanical Engineering

**ParisTech School:** Arts et Métiers ParisTech – Campus of Cluny - LaBoMaP

**Title:** Study of the growth of thin films in complex deposition condition

**Advisors:**

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

Most of the research in thin films performed in scientific laboratories concerns the properties of the coatings deposited in small chamber on “perfect” substrate (i.e. small silicon mirror polished wafer pieces) in a static mode. Upscaling these results to “complex” industrial conditions is sometime difficult. Indeed, in this latter case, the targets are bigger; the substrates can have one or two rotations and present complex geometry (size and shape) and a specific roughness (non-exhaustive list). Such conditions have a strong influence on the film microstructure, and consequently on the final properties.

The aim of this project is to study the growth of thin films in complex deposition conditions. At the outset, complex cases will be treated one by one and gradually combined. The study will have a strong experimental part (synthesis and characterization of films) closely linked to a numerical part based on three software (SRIM, SIMTRA and NASCAM). In parallel to the novel scientific results published in international journals, improvements of some of the software are expected in collaboration with the universities of Gent and Namur (Belgium).

**Required background of the student:** knowledge in informatics, practice of sputtering (PVD), knowledge in characterization tools (Optical microscope, profilometer, SEM, etc.)

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

A. Siad, A. Besnard, C. Nouveau, P. Jacquet, *Critical angles in DC magnetron sputtered thin films*, Vacuum (2016) 131, 305-311

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 (2016) 125, 118-122