Fundamental aspects of reactive magnetron sputter deposition

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Course Objectives

- Understand the fundamental processes driving (reactive) magnetron sputtering
- Develop strategies for dedicated experiments to unravel the complexity of reactive magnetron sputtering
- To get a good overview of the current literature and modelling techniques.

Course Description

Reactive magnetron sputter deposition is a mature technique often used in laboratories and at industrial level to grow compound thin films. The growth of these films is defined by the deposition conditions, and therefore a good knowledge of the deposition process is essential to tune the growth and as such the film properties.
After a short introduction on the physics of sputtering, the magnetron discharge and the transport of sputtered atoms through the gas phase, the course starts with a few definitions regarding reactive sputtering to show that the processes driving this technique are general applicable. This introduction assists the attendee to the next step : the description of the most common experiment during reactive magnetron sputtering, the hysteresis experiment. The simplicity of this experiment fools initially the scientist because it hides a complex interplay between different processes that define the actual outcome of the experiment. During the course, the details of this experiment are analyzed, and modelling is used to guide the attendee. In this way, the attendee will gain knowledge in a wealth of important process controlling the film growth. A good knowledge of these processes will arm the attendee to analyze and to control the reactive sputtering process.

Course Content

- Sputtering : physics of sputtering, and transport of sputtered atoms
- Magnetron discharges : typical features, electron emission, excitation and ionization
- Hysteresis experiments : what can we learn from this “simple” experiment ?
- Influence of deposition parameters
- Dynamics of reactive sputter deposition
- Arcing
- Discharge voltage behavior
- Process parameters and thin film growth
- Questions and answers

Who should attend?

This course is intended for engineers, scientists, and students
Interested in reactive sputter deposition and its applications.

Course materials

Lecture notes will be provided together with a copy of the handbook
“Magnetrons, reactive gases and sputtering”

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