EMPA – MATERIALS AND TECHNOLOGIES FOR A SUSTAINABLE FUTURE

As an interdisciplinary research institute of the ETH Domain, Empa, the Swiss Federal Laboratories for Materials Science and Technology, conducts cutting-edge materials and technology research. Empa's R&D activities focus on meeting the requirements of industry and the needs of society, and thus link applications-oriented research with the practical implementation of new ideas. As a result, Empa is capable of providing its partners with customized services and solutions that not only enhance their innovative edge and competitiveness, but also help to improve the quality of life for the public at large.

GENERAL INFORMATION

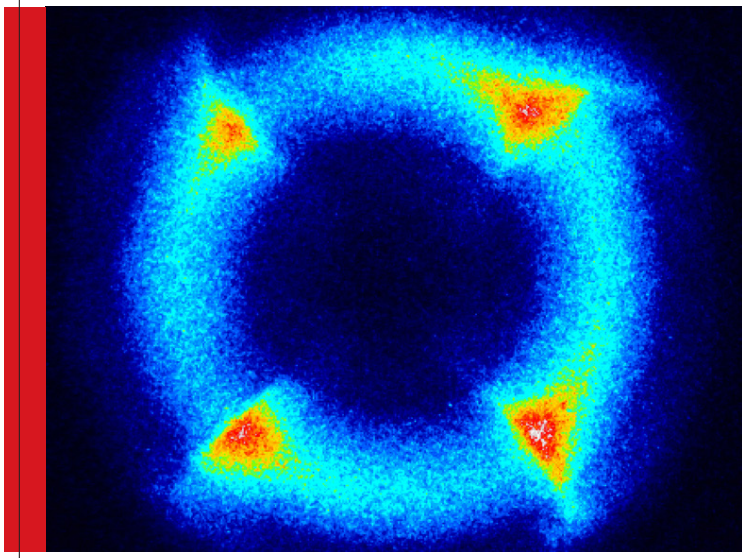
Location	Empa, Dübendorf Überlandstrasse 129 AKADEMIE
Costs	CHF 580.– CHF 240.– for Empa employees and students Workshop materials, lunch and refreshments included
Registration	www.empa-akademie.ch/thinfilm
Deadline	January 19, 2017
Cancellation	For cancellations after January 19, 2017, 50% of the fee will be charged. After January 26, 2017, or in case of non appearance we will charge the full fee. A substitute will be accepted anytime.
Contact	Empa **Dr Jörg Patscheider** Nanoscale Materials Science Phone +41 58 765 43 65 joerg.patscheider@empa.ch www.empa.ch
How to get here	Please do use public transport. There is only very limited parking available.

Empa Akademie

SHORT COURSE

Physics of Magnetron Sputtering

Plasma basics, DC, Pulsed and HiPIMS modes of operation



Empa, Dübendorf, Überlandstrasse 129
Thursday, February 2, 2017, from 8:30 to 17:00

Online registration:
www.empa-akademie.ch/thinfilm

TOPIC

Numerous variants of magnetron sputtering techniques are used to prepare thin films for a wide range of applications. This course is designed to provide in-depth knowledge on the physics of magnetron discharges to researchers and technologists working with thin film deposition. The operational principles of magnetrons will be introduced, and a variety of magnetron configurations will be shown (planar, cylindrical, dual, etc.). Various modes of magnetron operation with emphasis on DC, Pulsed and HiPIMS will be presented and illustrated with examples of practical thin film growth.

TARGET AUDIENCE

This course is intended for students, scientists and engineers interested in Magnetron Sputtering and related PVD techniques.

AIMS

The purpose of this course is to provide a widened understanding of magnetron plasmas used for thin film deposition processes. The course starts with a brief overview of some historic roots: Cathode disintegration, as sputtering was originally called, has its humble beginnings in the 19th century with discoveries related to generating and storing electrical energy and inventions establishing “empty space”: vacuum. In the 1930s, Penning described the trapping of electrons in certain electric and magnetic field configurations, concepts leading to the development of our modern magnetrons in the 1970s (Chapin, Clarke, Penfold and Thornton). The plasma of magnetrons will be specifically investigated, starting from the seemingly simple continuous dc operation to pulsed and finally high power impulse magnetron sputtering (HiPIMS). Plasma and sheath physics will be introduced having magnetrons in mind. A clear distinction of quasi-neutral plasma versus space charge in target and substrate sheaths will be discussed. The role of plasma instabilities such as spokes will be highlighted. The focus will then shift away from the plasma to films, where film microstructure is greatly affected by the fluxes of particles from the magnetron. Here we consider the effects of kinetic and potential energies as well as of the substrate temperature on the growing film. These considerations will be expanded from non-reactive to reactive deposition to show the industrial relevance of modern magnetron sputtering.

LECTURER

Dr André Anders

– Senior Scientist and Leader,
Plasma Applications Group
– Editor-in-Chief, Journal of Applied Physics

Lawrence Berkeley National Laboratory
Berkeley, California 94720, USA

REGISTRATION

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