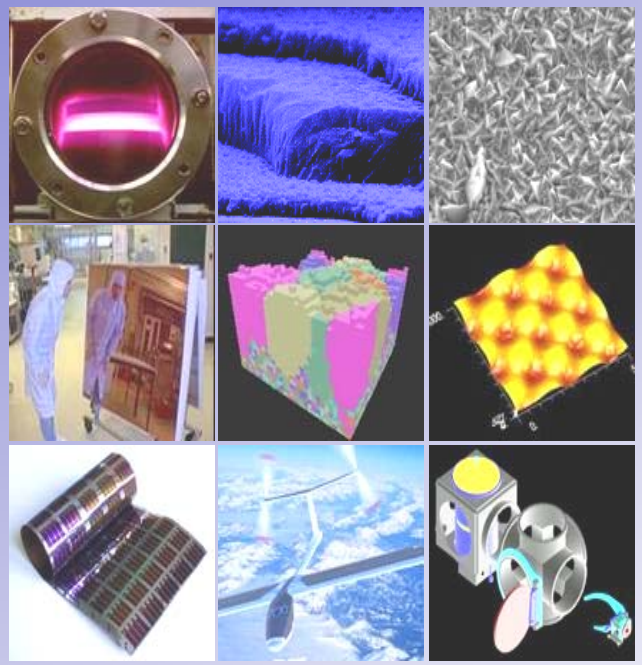
ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

PV-LAB

PV-LAB SCHOOL

ONE WEEK INTENSIVE TRAINING ON THIN FILM SILICON PHOTOVOLTAICS



Especially designed to provide participants with a high level understanding of thin film silicon photovoltaic devices, processes and market challenges

Next dates - To be discussed

Location Institut de microtechnique IMT, EPFL
Rue A.L. Breguet 2
2000 Neuchâtel, Switzerland

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Highlights

- State of the art on thin film PV and market situation
- Deposition techniques
- Thin film silicon
- Amorphous and micro or nano silicon materials
- Photovoltaic devices
- Back end; Encapsulation and testing
- TCO and light trapping
- Tandem solar cells
- Series interconnection, lasering
- Cell design and diagnostic
- Characterisation methods (spectroscopy, electrical measurements, shunts analysis…)
- Photovoltaic installations

PV-LAB

- A leading laboratory in PV
- Many PV-LAB school organised in the last years
- Pioneer in very high frequency deposition processes, micromorph technology, high performance TCO

Interactive

- Lab tour
- Cell diagnostic (IV, EQE measurements)
- Demonstration of various characteriation methods like Raman spectroscopy, thermo-lock-in shunt analysis, UV-Vis spectroscopy, dark conductivity measurements

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Details

Early rate 2200 € + VAT (7.6%) / participant*
Standard rate 2500 € + VAT (7.6%) / participant

Rates include the support training material (Paper version at the beginning of each lesson + CD at the end of the week), 1 welcome aperitif, coffee breaks, lunches for five days.
Accommodation is not included in the course price. Information on accommodation will be sent upon registration.

* The lecture will take place with a minimum of 10 participants. A maximum of 16 participants per session is accepted
* Early rate means registration at least 1 month before the beginning of the session.

Detailed program

See typical training program on next page

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PV-Lab school program

Timetable	$8h^{00}$-$8h^{45}$	$9h^{00}$-$9h^{45}$	$10h^{00}$-$10h^{45}$	$11h^{00}$-$12h^{00}$	Lunch	$13h^{30}$-$14h^{15}$	$14h^{30}$-$15h^{15}$	$15h^{30}$-$16h^{15}$	$16h^{30}$-$17h^{15}$	
Monday	**General intro to Thin Film PV School** ▪ *Introduction to PV* ▪ *Different PV technologies* ▪ *Thin Film Si vs. c-Si* ▪ *Market situation*					**General deposition techniques** ▪ *Plasma physics and deposition* ▪ *Reactor design* ▪ *Prospects*			**Lab tour** ▪ *Deposition systems* ▪ *Diagnosis tools*	Apero
Tuesday	**Thin Film Silicon** ▪ *Definitions* ▪ *Semiconductor physics, bandgap* ▪ *Optical properties* ▪ *Microstructure* ▪ *Stability, Staebler-Wronski effect*			**Laser scribing** ▪ *Intro* ▪ *Choice of laser* ▪ *Monolithic interconnection* ▪ *Issues*		**Modules, encapsulation & testing** ▪ *Module production steps (thin-films)* ▪ *Equipment* ▪ *Material properties (delamination issues)* ▪ *Standards and testing* ▪ *Effects when measuring thin-film modules*			**PV installation** ▪ *Stand-alone* ▪ *Grid connection* ▪ *Batteries, converters*	
Wednesday	**Intro to PE-CVD** ▪ *CVD vs PECVD* ▪ *Plasma discharge & deposition systems, monitoring* ▪ *Where is the industry today: systems and electrode designs* ▪ *VHF vs 13.56 MHz* ▪ *Film properties vs plasma parameters*			**Lock-in thermo-graphy** ▪ *Intro* ▪ *Set-up* ▪ *Software and options* ▪ *Practice*		**Amorphous silicon (a-Si:H)** ▪ *Defect density* ▪ *DOS, localized and extended states, absorption processes* ▪ *Transport mechanisms, doping* ▪ *Recombination* ▪ *Stability* ▪ *Practical examples*			**Dark conductivity** ▪ *Important parameters* ▪ *Typical values* ▪ *Set-up* ▪ *Examples of meas.*	
Thursday	**pin & nip devices** ▪ *Physics principle* ▪ *Diode equation* ▪ *Efficiency limits, losses* ▪ *p-i-n vs. p-n* ▪ *p-i-n vs. n-i-p stability issues, requirements for cell design (light-trapping)*			**Raman spectro-scopy** ▪ *Intro* ▪ *Theory* ▪ *Practice*		**TCO & light trapping** ▪ *TCO material family* ▪ *TCO for thin-film silicon solar cells* ▪ *Characterization techniques* ▪ *Light trapping management*			**UV-Vis Spectro-scopy** ▪ *Principle* ▪ *Set-up* ▪ *Examples of meas.*	
Friday	**Microcrystalline silicon (μc-Si:H)** ▪ *Influence of the substrate (or underlayers) on growth* ▪ *State-of the art efficiency* ▪ *Advantages of μc-Si:H for photovoltaics* ▪ *Practical examples*		**Tandem cells** ▪ *Concept* ▪ *State of the art* ▪ *Constraints on current matching* ▪ *Stability vs single-junction cells*			**Cell design and cell diagnosis** ▪ *IV, QE: intro & practice* ▪ *P-i-n cell design (e.g. p-a-Si, p-a-SiC,…)* ▪ *Diagnosis for bad cell performances (shunts, interfaces,..)* ▪ *Simulations: intro to "SunShine" software*			**Multiple choice,** **Questions, Discussion**	