

# Journée des labos

organisateurs **S2E2**, Agence régionale des Pays de la Loire,  
Angers Technopole, CAPTRONIC, ID4CAR, LEA Valley

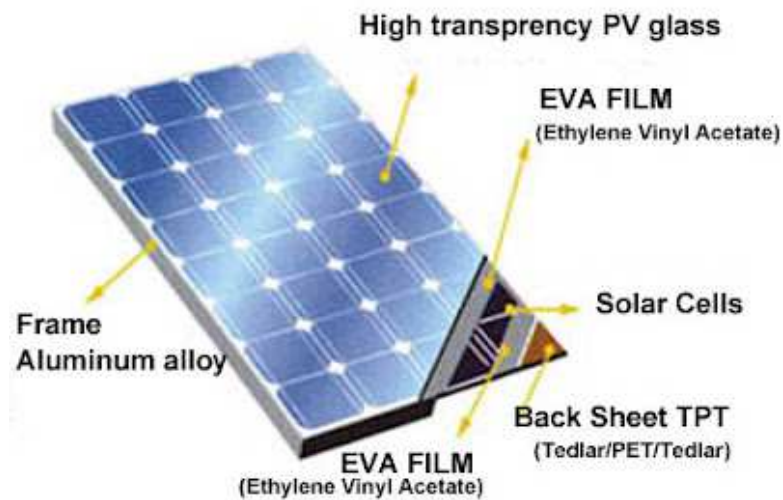
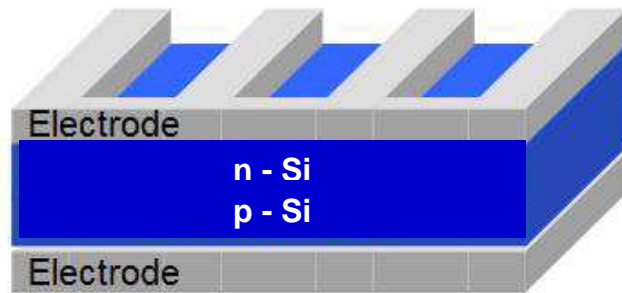
## Matériaux d'électrode pour cellules solaires et électronique plastique transparente



**Mihaela GIRTAN**

# Cellules solaires de première et deuxième génération

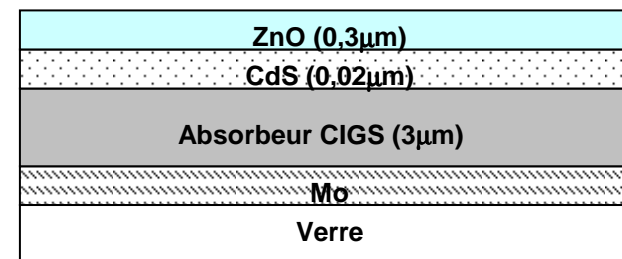
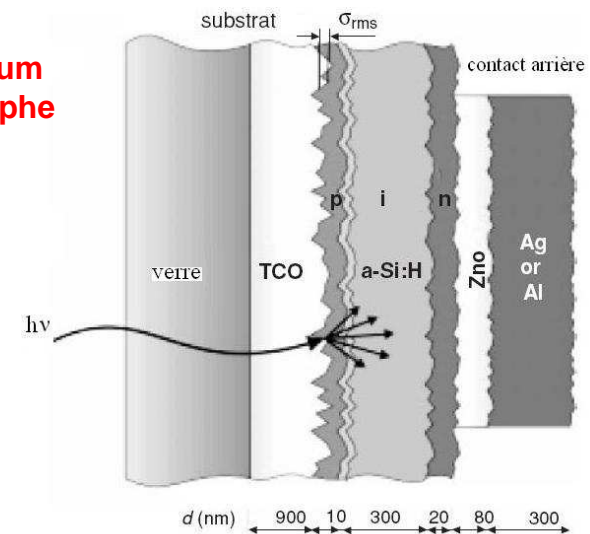
## 1<sup>ère</sup> génération



## Silicium mono- et poly-cristallin

## 2<sup>ème</sup> génération

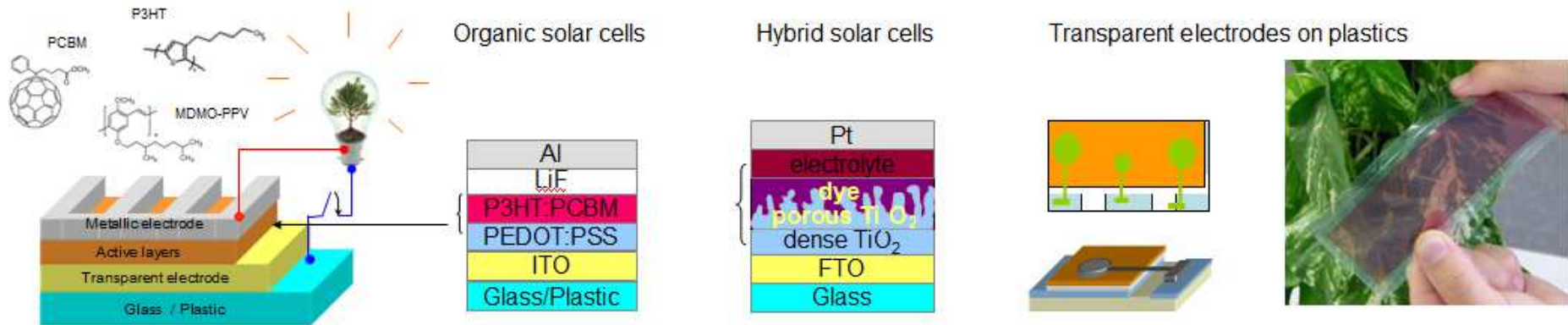
### Silicium amorphe



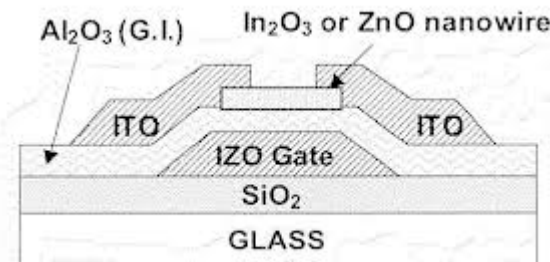
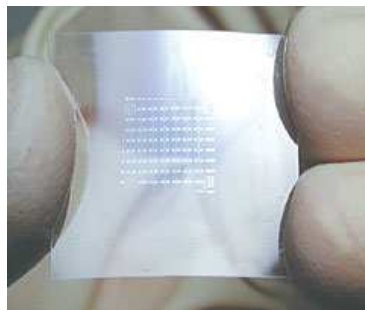
### Structure d'une cellule CIGS

# Applications et dispositifs

cellules solaires de 3eme génération / électronique transparente

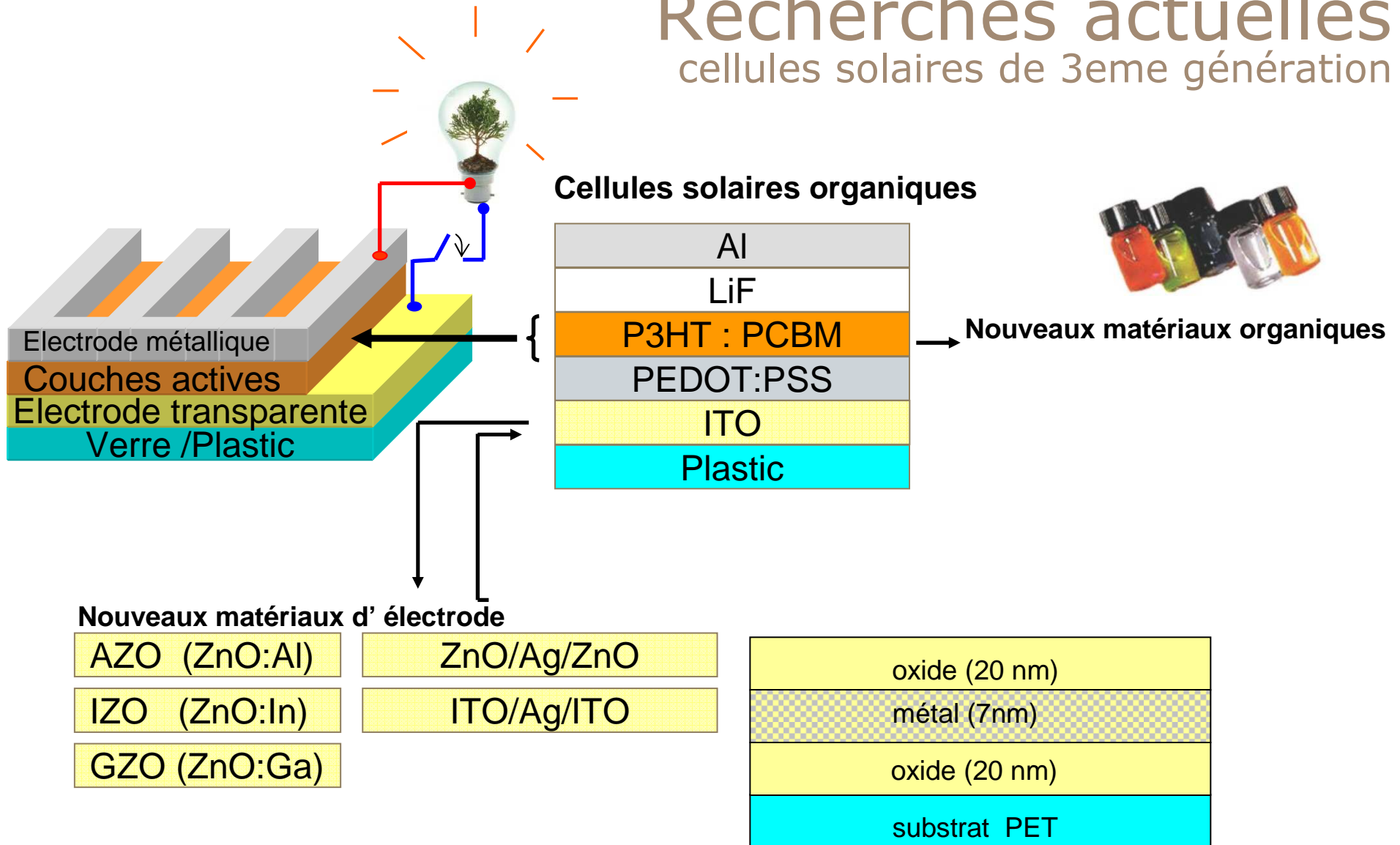


Cost fabrication reduction by replacement of ITO, degradation and stability studies, thin films and devices characterization



# Recherches actuelles

## cellules solaires de 3eme génération





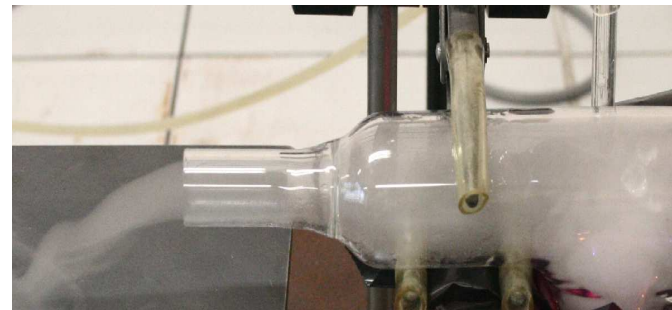
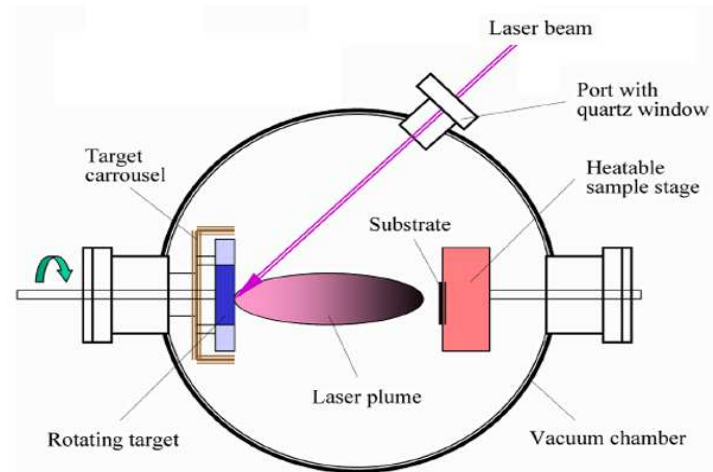
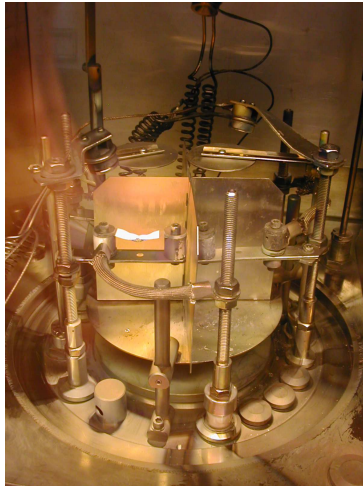
# Matériaux

## Semi-conducteurs transparents et conducteurs

Matériau	$\text{In}_2\text{O}_3$	$\text{SnO}_2$	ZnO
Éléments dopants	$\text{V}_\text{O}^\circ$ , Sn, F, Te	$\text{V}_\text{O}^\circ$ , Sb, F, P	$\text{V}_\text{O}^\circ$ , Al, In, Ga
Travail d'extraction (eV)	4.1-5.5	4.2-4.4	4.3-4.4
Gap (eV)	3.5-3.7	4.0-4.5	3.2-3.6

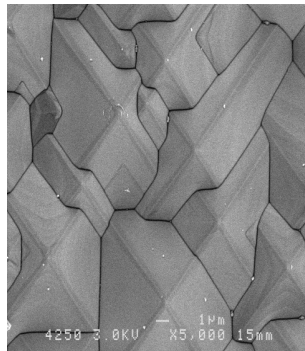
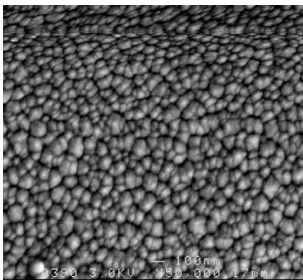
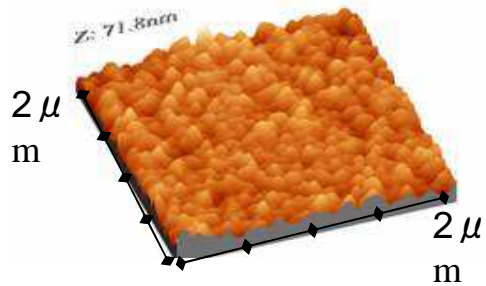
Matériau	PEDOT:PSS	PANI
Travail d'extraction (eV)	5.1	4.5-4.7

# Techniques de dépôt



# Caractérisation propriétés morphologiques et structurales

AFM

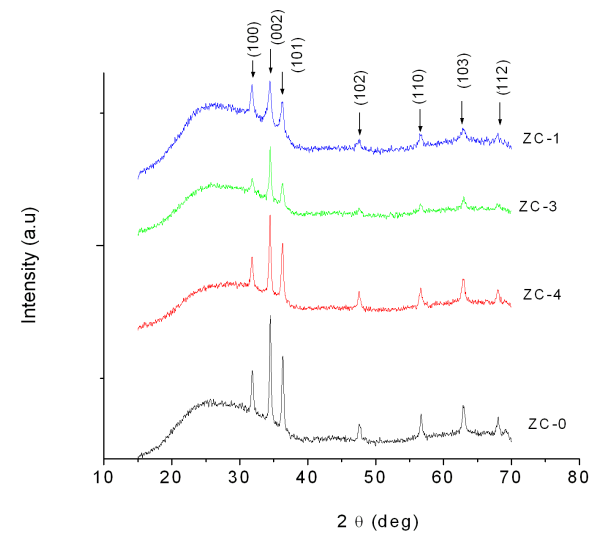


MEB



Angle de contact

Plateformes communes SCIAM et PIAM

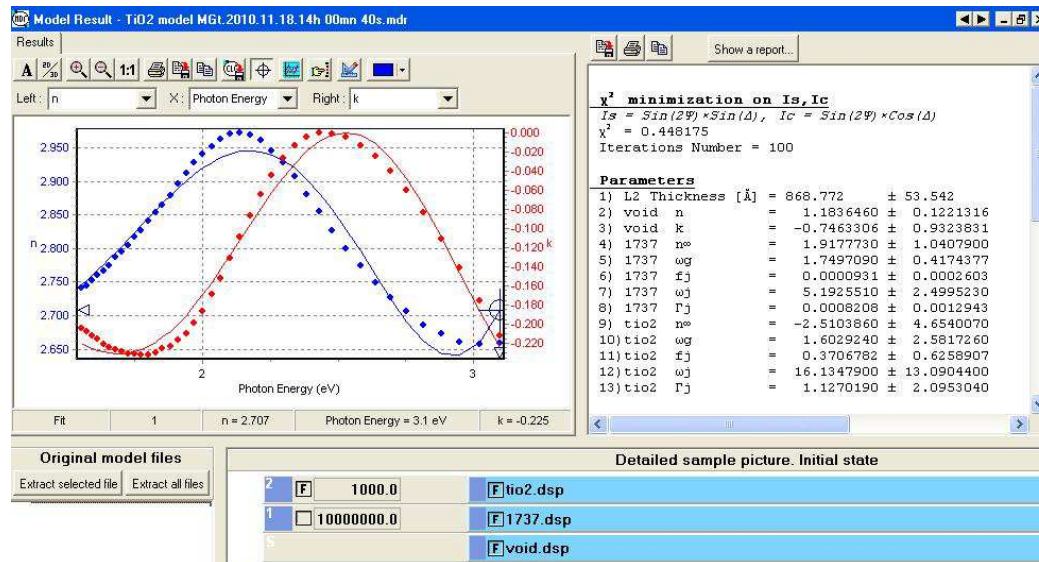
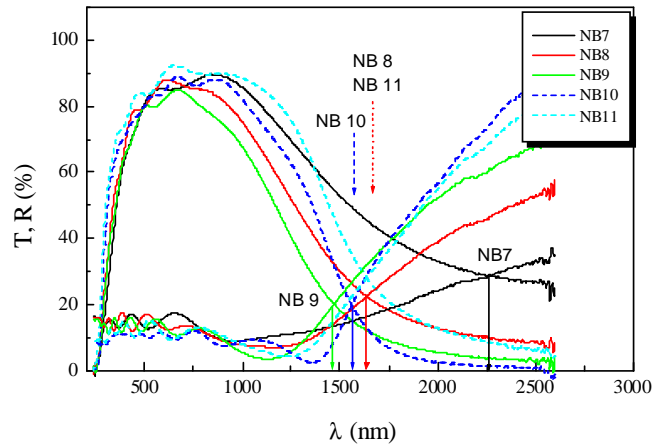


XRD

# Caractérisation propriétés optiques

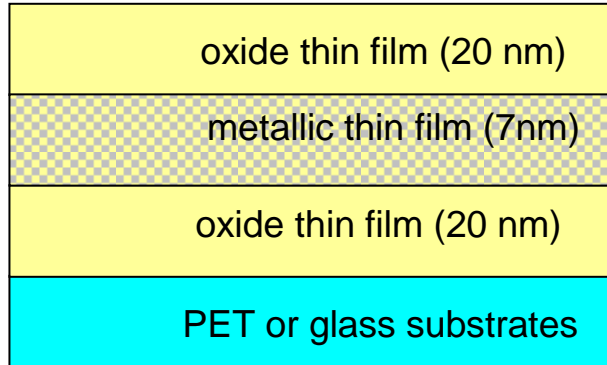
Spectrophotométrie

Ellipsométrie

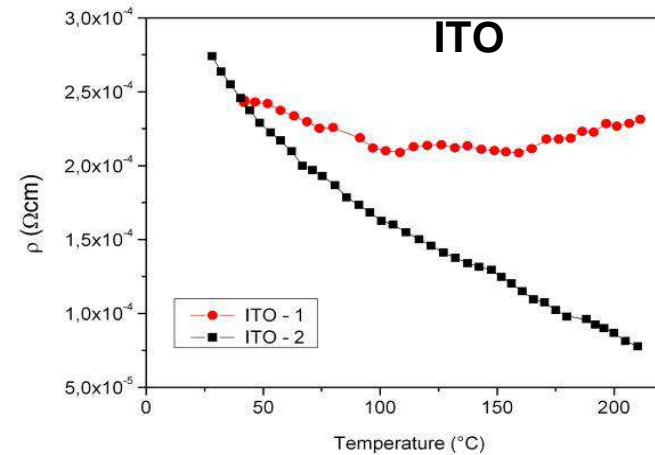
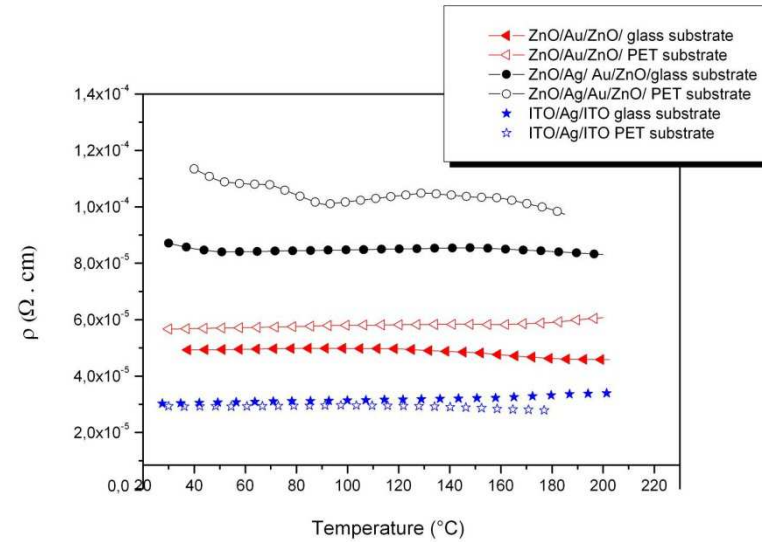




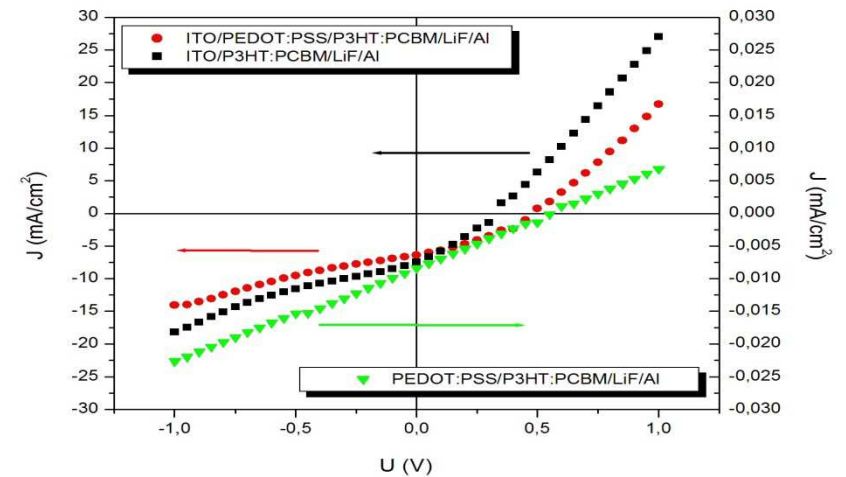
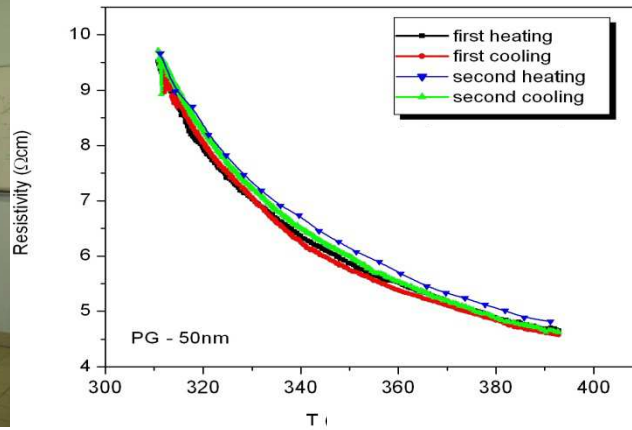
# Films transparents et conducteurs



M.Girtan,  
Sol. Ener. Mat. & Sol. Cells  
 100 (2012) 153



# Caractérisation propriétés électriques



# Contrats, Publications

Projet régional PERLE 2 (2010-2013) , Projet européen ERA-RUS-NET (2012-2014)

## Publications 2012-2013

M.Girtan, «*On the stability of the electrical and photoelectrical properties of P3HT and P3HT:PCBM blends thin films*», Organic Electronics, (2013)

M.Girtan et al, «*On the Properties of Al: ZnO Thin Films Deposited on Plastic Substrates from Ceramic Targets*» Applied Surface Science, (2013)

L.Leontie, I.Evtodiev, N.Spalatu, M.Caraman, S.Evtodiev, O.Racovet, M.Girtan, C.Focsa, «*Optical and photosensitive properties of lamellar nanocomposites obtained by Cd intercalation of GaTe*, Journal of Alloys and Compounds (2013)

A.V. Manole, M. Dobromir, M. Girtan, R. Mallet, G. Rusu, D. Luca, «*Optical properties of Nb-doped TiO<sub>2</sub> thin films prepared by sol-gel method*», Ceramics International, (2013)

M. Girtan, «*Comparison of ITO/metal/ITO and ZnO/metal/ZnO characteristics as transparent electrodes for third generation solar cells*», Solar Energy Materials and Solar Cells, (2012)

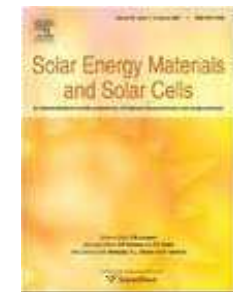
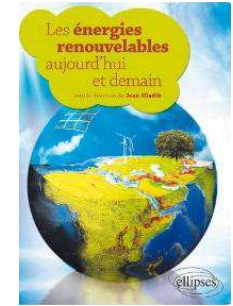
M. Soyly, M.Girtan, F. Yakuphanoglu, «*Properties of PEDOT:PEG/ZnO/p-Si heterojunction diode*» Materials Science and Engineering B, (2012)

D. Mardare, A. Yildiz, M. Girtan, A. Manole, M. Dobromir, M. Irimia, C. Adomnitei, N. Cornei, D. Luca, «*Surface Wettability of Titania Thin Films with Increasing Nb Content*», Journal of Applied Physics, (2012)

F. Stanculescu, A. Stanculescu, M. Girtan, M. Socol, O. Rasoga, «*Effect of the morphology on the optical and electrical properties of polycarbonate film doped with aniline derivatives monomers*» Synthetic Metals, (2012)

I. Vaiciulis, M. Girtan, A. Stanculescu, L. Leontie, F. Habelhames, S.Antohe, «*On titanium oxide spray deposited thin films for solar cells applications*» Romanian Academy, (2012)

L. Leontie, R. Danac, M. Girtan, A. Carlescu, A. P. Rambu, Gh. I. Rusu, «*Electron transport properties of some new 4-tert-butylcalix[4]arene derivatives in thin films*» Materials Chemistry and Physics, (2012)



# Contact



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<http://sites.google.com/site/mihaelagirtan>

Responsable de l'activité « couches minces » - LPHIA  
Responsable de la Licence Pro « Energies renouvelables »

## Collaborations: Laboratoire - Entreprise

### au niveau de l'enseignement

- Intervention des professionnels dans nos formations professionnelles
- Stage en entreprise pour les étudiants de LP et MP
- Visite des entreprises
- Promotions des produits industriels, présentation des produits français – matériel pédagogique
- Promotion de l'Industrie française à travers le projet international Solar Décathlon

### au niveau de la recherche

- Vielle technologique
- Expertise & Conseil
- Thèses en collaboration (CIFRE)
- Projets ANR (crédits impôt recherche)

