EPS Young Minds
3rd Leadership Meeting Day
6th - 7th June 2014
Paris

Maria José Lo Faro
Ph.D. Student @
University of Catania
CNR-IMM of Catania – CNR-IPCF of Messina

mariajose.lofaro@ct.infn.it
Outline

• EPS YM - Catania Section

• Activities
  • Past
  • 2014

• Future Projects
About Catania
EPS YM Catania Section

http://www.matis.imm.cnr.it
http://www.dfa.unict.it/csdaf
EPS YM Catania Section
CNR - IMM Research Areas

Si Photonics
Photovoltaics
Microelectronics and Sensors
Coherent Dynamics of Nanosystems
Nanostructures
Thin Films
Silicon Nanowires

Si NWs

Sensors

Solar Cell

LED

Irrera et al., Size-scaling in optical trapping of silicon nanowires, Nanoletters 2011, 11, p 4879
Past Activities

*January – June 2013*

**TCO role for Photovoltaics Applications**
Dr. M. tucci – ENEA Roma

**Chirality of Polymers in Excited States**
Prof. T. Nakano – Hokkaido University

**Electromagnetically induced transparency from atoms to semiconductors**
Prof. G. La Rocca – Scuola Normale di Pisa

**In vivo imaging of the brain network**
Dr. S.S. Sato – Ph.D @ Scuola Normale di Pisa
Applicazioni del TCO in ambito fotovoltaico

Dr. Mario TUCCI

Mercoledì, 30 Gennaio 2013

Aula F - ore 15:00

Dipartimento di Fisica e Astronomia,
Via S. Sofia 64 Catania

Nel seminario verranno descritte brevemente le attività di ricerca e sviluppo nell’ambito del fotovoltaico presenti in ENEA dal silicio cristallino al film sottile. Successivamente si descriveranno le applicazioni principali del TCO in ambito fotovoltaico prendendo in considerazione gli strati di ITO e ZnO:Al realizzati via RF magnetron Sputtering. In particolare si descriveranno le proprietà elettriche ed ottiche dei due materiali e gli effetti relativi alle applicazioni dei due materiali nelle architetture di cella a film sottile di tipo tandem amorfo microcristallino e nelle celle a estensione silicio amorfo-Si cristallino. Infine si presenteranno le proprietà ed il dimensionamento dello strato ZnO:Al in configurazione multilayer con strati di Ag per aumentarne la conducibilità.
Chirality of Polymers in Excited States

L’Associazione Alumni SSC e EPS Youngminds Catania section organizzano un seminario tematico tenuto dal Prof. Tamaki Nakano

Giovedì 21 marzo 2013, ore 21
Villa San Saverio
Scuola Superiore di Catania

Fluorescent and phosphorescent organic polymers are an important class of materials for organic light-emitting diodes (OLEDs) based on their advantages that emission properties can be modified through molecular designs, that they are inherently light and flexible, and that they can be readily fabricated by solution processes. Among various polymers of this class, those emitting circularly polarized light (CPL) are of particular interest because of their potential for photonic devices such as 3D displays and energy-efficient backlights for LC displays. We have synthesized two types of CPL-emitting chiral polymers, i.e., a hyperbranched fluorenevinylene polymer (1) and poly[2,7-bis(4-t-butylphenyl)dibenzofulvene] (2). 1 and 2 emits green CPL and white CPL, respectively. It should be noted that 1 emits CPL at a high efficiency (anisotropy) in an amorphous film without any detectable inter-chain alignment. 1 may take a highly anisotropic structure in excited states that largely differs from the chiral structure in the ground state.

Tamaki Nakano, Ph.D. (Osaka University, 1991), is Full Professor at Catalysis Research Center, Hokkaido University since 2006. He was at Nagoya University, Cornell University and Nara Institute of Science and Technology. His interests include chiral polymers, \( \pi \)-Stacked polymers, molecular chirality induction to polymers using CPL, chiral supramolecular LCs.
Electromagnetically induced transparency from atoms to semiconductors

L’Associazione Alumni SSC e EPS Youngminds Catania section organizzano un seminario tematico tenuto dal Prof. Giuseppe La Rocca

Lunedì 22 aprile 2013, ore 21
Villa San Saverio
Scuola Superiore di Catania

Quantum coherence and interference can be used to control the light-matter interaction and the propagation of light in multilevel systems. A survey of one of the most attractive techniques, electromagnetically induced transparency (EIT), will be given from the discovery of coherent population trapping, through a few related milestones such as adiabatic transfer and amplification without inversion, up to the investigation of EIT proper. Our theoretical results on both cold atom systems and solid state systems, including new photonic crystal structures created via coherent optical non-linearities, will be discussed.

In vivo imaging of the brain network

Sebastian Sulis Sato
Scuola Normale Superiore di Pisa, laboratorio NEST

Friday, May 17th 2013
12.00 - Aula F

Dipartimento di Fisica e Astronomia

Multiphoton microscopy is a spectroscopic imaging technique based on the excitation of common fluorescent molecules through low energy infrared light. This allows the use of fluorescence microscopy to study living tissues. In particular, the combination of this technique with ion-sensitive fluorescent dyes, such as calcium indicators, can provide useful insights on brain physiology in vivo. This presentation will show the state of the art of this technique.

Sebastian Sulis Sato is PhD candidate at the Scuola Normale Superiore di Pisa. He is coauthor of different high impact papers on molecular neuroscience.
Present Activities

January – June 2014

**Workshop:** Graphene Day

**Transparent Conductive Oxides**
Dr. E. Pecora – Stanford University

**Lectures on Nanoplasmonics & Nanophysics**
Prof. R. Carles – Toulouse University
Graphene Day

Workshop on Graphene and Graphene-Related Compounds

G. Compagnini  I. Deretzis
F. M. D. Pellegrino  F. Giannazzo
G. Barbarino  O. M. Maragò
V. Romano  F. Ruffino
A. La Magna

Workshop: Friday, 7 February 2014
Aula A - 8:30 - 18:30
Dipartimento di Fisica e Astronomia
Via S. Sofia 64, Catania.
Transparent Conductive Oxides: a new material platform for optoelectronic, plasmonic and photovoltaic.

Dr. Emanuele Francesco Pecora

PostDoctoral Scholar
Stanford University - CA, USA,
Geballe Laboratory for Advanced Materials

SEMINAR: Wednesday, 8 January 2014
Aula M - 15:30
Dipartimento di Fisica e Astronomia,
Via S. Sofia 64 Catania.
The members of EPS young minds Catania Section and of the Archimedes Chapter would like to invite you to participate at a cycle of four lectures by Prof. Carles (from Toulouse Univ. and CEMES-CNRS) in the field of Plasmonics and Nanophysics. Here the programs of the first two lessons.

---

**PLASMONICS: the "missing link" between photonics and electronics**

*Robert Carles*

**First part (fundamentals) 5/5/2014**

- Surface plasmon-polariton excitations
- Dielectric response (scattering and absorption)
- Plasmonic modes partially propagative (2D, 1D)
- Plasmonic modes completely localized (0D)

**Second part (applications) 13/5/2014**

- Signal propagation: guides, transmission, diffraction
- Signal absorption: thermo-plasmonics (phonons generation...)
- Photocatalysis (electron-holes generation...)
- Signal scattering and amplification: spectroscopies (photons generation...)
- SERS, sensors, high contrast imaging
Nanophysics: confinement and spectroscopy of electrons and vibrations

Robert Carles

Third Part (fundamentals) 04 giugno 2014
ore 15.30 - Aula E

Surface and quantum effects
Confinement and quantum boxes (0D)
Classical approximation: density of states
Quantum wells (2D) and quantum wires (1D)
0D - 3D transition
Fermi gas and Bose condensate
Quantum metrology

Forth part (optical spectroscopy) 11 giugno 2014
ore 15.30 - Aula E

Optical spectroscopies
"1 photon " (absorption, emission)
"2 photons " (elastic and inelastic scattering, photoluminescence)
Raman spectroscopy of nano-objects
Enhanced spectroscopies (resonance-, plasmonic-, interference-)
Spectroscopy at the nanoscale (single object, tip-enhanced)
Future Projects

• Recruiting Day

• Effective and Communicative language

• Joint activities between EPS YM Catania & Messina Sections
From EPS YM Catania Section:
Thanks EPS YM

Thank You
for your kind attention!

Special Thanks to:
Antigone Marino
Ophélia Fornari
& Pietro Artoni