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Nano Lab LTFN: At a Glance

Nanotechnology Lab LTFN - Aristotle University of Thessaloniki
Founded by Prof. S. Logothetidis in 1991

LTFN Innovative Technologies:
• Thin Films & Nanoengineering
• Organic & Printed Electronics
• Nanomedicine & Nanobiotechnology
• Nanometrology & Optical Technology
• Computational Modeling at Nanoscale

http://www.ltfn.gr

• 30-35 Expert Scientists (Physicists, Chemists, Engineers, Biologists, Medicine)
• 5-7 Technicians & Support
• 2300 m² of Lab Space
• >70 Affiliated Labs
• 100 Affiliated Researchers in Europe

Razor Blades
Lenses & Cutting Tools
Packaging
Stents & Implants
OPVs
OLEDs
OTFTs
Biosensors
Wearables

Meeting 22/05/2017, Thessaloniki, Greece
Nano Lab LTFN: Applications

- **Organic Electronics**: OLEDs for displays and lighting, OPVs, OTFTs, Sensors, RFID
- **Energy**: OPVs for Electricity, OLED lighting for Energy efficiency
- **Wearables**: Smart Textiles with energy and lighting functionalities
- **Buildings**: Energy efficient buildings, Lighting, Tents, Roofs
- **Automotive**: Energy generation and Autonomy, Solar roofs
- **Agriculture**: Energy efficient Mediterranean Greenhouses by OPVs & OLEDs, Smart Packaging
- **Smart Packaging**: Food, Consumer products, Pharmaceutical products
- **Nanomedicine**: Drug Delivery Systems, Stents, Orthopaedic implants, Contact lenses, Biosensors
- **Information Technology**: Organic Electronics, Micro-electronics, Optoelectronics and Optics, Storage and Displays, Micro–fabrication, IoT
Nanotechnology Lab LTFN Location

**Host Organization:** Physics Department, Aristotle University of Thessaloniki, Greece

**School of Exact Sciences, AUTh**

**COPE-H, Thermi, Airport Area**
Center of Organic & Printed Electronics – Hellas (COPE-H)

Research & Manufacturing of OE Devices for Applications in: Energy, Lighting, Electronics, NanoBioMed, Smart Textiles & Food Packaging, Greenhouses, etc

- Area: 2000 m²
- Clean Rooms: 600 m²
- R2R Pilot & Production Line for Fabrication Large Area OE
- OVPD Pilot Line
- S2S Pilot Line for OE Devices
- CVD Pilot Line for Graphene on 6” Substrates
- Slot Die, Ink-Jet Printer Systems for OE Devices
- In-line Pulsed Laser & Metrology Technologies
Overview of Facilities & Infrastructures

**Thin Films Fabrication & Nanomaterials Synthesis**
- UHV, HV chambers for PVD methods
- Lab scale R2R line
- Printers (Inkjet, gravure)
- Spray Technologies

**Optical Technology & Nanometrology**
- 9 Unique Spectroscopic Ellipsometers (IR-NIR-Vis-fUV)
- 4 Unique Raman Systems
- 2 In-line Photoluminescence Systems

**Characterization – NanoMetrology - Testing**

**NANOMEDICINE**
Nanotechnology Lab LTFN: Organic & Printed Electronics Pilot Lines

R2R Printing Pilot & Production Line
• Printing (Gravure, Slot die, Inkjet, Screen) Techniques
• OPVs, OLEDs, OTFTs, Sensors, etc.
• In-line (SE & RS) Metrology for Quality Control
• Pulsed Laser for Scribing/Structuring/Ablation
• Encapsulation Module

OVPD Gas Transport Pilot Line
• Fabrication of OPVs, OLEDs, OTFTs, Sensors, etc
• In-situ (SE & RS) Metrology for Quality Control

CVD Pilot Line
• Growth on 6 inch Substrates
• Graphene & other 2D Materials
• Real time (SE and RS) Metrology

S2S Hybrid Pilot Line
• Inkjet, Slot die, VTE, etc
• Solar Simulators (up to A4 size)
• OPVs, OTFTs, OLEDs, Sensors, etc.

Characterization Capabilities
• IR to far UV SE, Raman, PL, SNOM
• In-Situ, In-Line, Real-Time, Ex-Situ Optical Monitoring
• Methodologies & Computational modeling
• AFM, X-rays, XPS, Electrical & Barrier properties
• Nanoindentation, Contact Angle measurements
Nano LTFN: 26 Years of Excellence & Technologies….

Meeting 22/05/2017, Thessaloniki, Greece
Industrial Collaborators

• FCA (Fiat Chrysler Automotive)  
  Centro Riserche Fiat, Italy  
  Physical Analysis Department, Group Materials Labs, Group Surface Engineering Labs

• AIXTRON Ltd, UK  
• AIXTRON SE, Germany  
• Horiba Jobin Yvon, France  
• Applied Materials  
• Coatema, Germany  
• ELAS, Lithuania  
• SURAGUS, Germany  
• Laytec, Germany  
• IBS Engineering, The Netherlands  
• AMCOR, Switzerland  
• Graphenea, Spain  
• Oxford Lasers, UK

• Violex BIC, Athens, Greece  
• Union Optic, Thessaloniki, Greece  
• Advent, Patras  
• Kechagias Super Alloys, Thessaloniki, Greece  
• ELVE SA, Kavala  
• Prisma Electronics, Alexandroupolis  
• Biohellenica, Thessaloniki  
• Siamidis Textiles, Athens  
• MIRTEC EVETAM, Athens  
• Compucon, Thessaloniki  
• OET, Thessaloniki
Nano Lab LTFN: Education & Training MSc Students

Founder of Interscientific Post Graduate Program since 2002
"Nanosciences and Nanotechnologies - N&N"
Aristotle University of Thessaloniki - AUTh

Co-Founder Post Graduate Program since 1995
"Materials Physics and Technology"
Aristotle University of Thessaloniki

- The 1st MSc in Europe
- 30 PhDs
- >20 PhD Candidates
- >205 Graduates
- 50 Active Students
- 30 MSc Thesis ongoing

http://nn.physics.auth.gr
http://mater.physics.auth.gr
Output and Impacts: Chapters & Books

Total: 26 Chapters & Books


- “**Horizons in Clinical Nanomedicine**”, Ed. by S. Logothetidis, V. Karagkiozaki, 2014, Pan Stanford Publishing


1. US Patent No: 7,777,882, "Method for the in-situ and real-time determination of the thickness, optical properties and quality of transparent coatings during their growth onto polymeric substrates and determination of the modification, activation and the modification depth of polymeric materials surfaces" S. Logothetidis


3. Pending patent Application: "Development of Technology for Nanostructures & Superlattice Coatings (Ultrahard – Biocompatible – Antibacterial) for Mechanical, Medical and Aesthetics Applications“ V. Karagkiozaki, S. Logothetidis

4. PCT/GR2012/0100450: "Method for production of multi-layer nanoporous biodegradable polymeric coatings and it’s products“. V. Karagkiozaki, S. Logothetidis

5. PCT/15/500698: "Razor Blade Coating”. S. Logothetidis, N. Kalfagiannis, G. Vlachos
14 Years in Thessaloniki with >1000 Participants from 60 Countries every year!

www.nanotexnology.com
Research & Innovation Network: NanoNet (www.nano-net.gr)

NanoNet
research & innovation network

Vertical Clusters
• Nano(Bio)Medicine
• Thin Films & Organic Electronics
• Nanomaterials & Nano-engineering
• Nano in Energy & Environment

Horizontal Clusters
• Nanometrology & Tools
• Modeling at the Nanoscale
• Legal, Ethics & Health Safety Issues

Since 2003
520 Organisations (Universities, Research Centers, Companies, Hospitals)

- 225 from Greece
- 220 from Europe
- 29 from USA and Canada
- 35 from Asia
- 95 Companies
- 10 Hospitals

NANONET Clusters
- Organic Electronics
- Nanobio
- Nanometrology
- Nanomaterials
- Energy
- Computational

- 26%
- 28%
- 19%
- 12%
- 7%
- 8%

- Nano(Bio)Medicine
- Thin Films & Organic Electronics
- Nanomaterials & Nano-engineering
- Nano in Energy & Environment

- Vertical Clusters

- Horizontal Clusters

- Official body representing the Greek Nanomedicine Community in Europe and worldwide
- Boost Greek Nanomedicine business sector
- Establish collaborations in Nanomedicine
- Foster Technology Transfer and funding opportunities
- Translate the Greek Nanomedicine Research into Clinical Practice
- Comprise an Networking, Dissemination of Nanomedicine Research Activities

NanoNet members worldwide
Hellenic Organic & Printed Electronics Association (HOPE-A)

• Hellenic Organic & Printed Electronics Association (HOPE-A)
• Established in 2011
• HOPE-A Founder & President: Prof. S. Logothetidis
• Members: 32
• Links & Collaborations with Associations: OES, COPT, AFELIM, JAPEC with 400 Companies

HOPE-A Mission: to Organize the Greek Industrial & Research Entities to Establish the Greek Organic & Printed Electronics Industry and to Support its Activities & Targets

Website: www.hope-a.com

HOPE-A Scopes:
• Create a Network of Private Companies Working in the OEs
• Develop Strong links between R&I, Manufacturing and Business
• Create New Applications & Technologies Roadmap
• Enhance the Reputation of the Sector
• Strengthen Contacts with Global Organizations
**Hellenic Organic & Printed Electronics Association/ HOPE-A**

- Create a Network Working in OEs
- Develop links between R&I & Manufacturing
- Generate Applications & Technologies Roadmap
- Enhance the Reputation of the Sector
- Strengthen Contacts with Public
- Distribute Information from the Markets
- Attract Investments in OEs
- Promote the Member’s Activities
- Organize Educational/Training Activities

**Collaboration Agreements in Europe:**

- **30/10/2013**
- **10/6/2014**
- **18/12/2014**
- **05/07/2016**
Εταιρεία παραγωγής και διάθεσης προηγμένων νανο-επικαλύψεων για εφαρμογές στους κλάδους Κοσμημάτων & ρολογιών, Διακοσμητικών ειδών, Επιφανειακής Προστασίας και Βιοσυμβατών συστημάτων
Start-Up Companies in OEs 2012-2014

Organic Electronic Technologies (OET)
- Research & Pilot-Production in OPVs, Biosensors, OTFTs etc
- In-line Metrology and Quality Control
- Turn Key Solutions in OEs Production
- Novel Processing Services on OEs

BL NanoBiomed
- Research, Development, Prototyping & Commercialization of: Nanotechnology - Enabled Drug Delivery Systems for Implants and Biomedical Devices

Nanotypos
- Research & Technology for the Development & Commercialization of Products realized by of R2R Nanoimprint Lithography Processes

DEFINE (Designer Endohedral Fullerenes for Information, Nanotechnology & Energy)
- Scaled Up Production of Endohedral Fullerenes
Engaging with Industrial Stakeholders to Boost OE Industry in Greece

7th WORKSHOP
“Creating the Organic & Printed Electronics Industry in Greece”
18-19 Dec 2014, Thessaloniki

8th WORKSHOP
“Boosting the Organic & Printed Electronics Industry in Greece”
31 May 2016, Thessaloniki
Inauguration of COPE-H, MOU between HOPE-A & JAPEC