EASTERN MACEDONIA
AND
THRACE INSTITUTE OF
TECHNOLOGY

HEPHAESTUS
ADVANCED
LABORATORY

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New knowledge, technologies and innovations can turn societal challenges into opportunities for the region

Excellence in

Education

Research Driven Education

Research

Application Driven Research

RESEARCH ACTIVITIES

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HEPHAESTUS ADV. LAB.

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focused on

- Material Science and Nanotechnology
  using nanoporous materials
- Electrical Engineering
  remote electrical measurements “sensors”
- Mechanical Engineering
  Robotics - Renewable Energy Systems (RES)

Research Objectives

- Innovative Application-based problem solving in respect to the existing needs, existing problems and challenges for the future.
- Economical evaluation of the obtained innovative research results (process costs, etc.)

The **Eastern Macedonia and Thrace Institute of Technology** has an unique, high level and advanced infrastructure to characterize materials, (organic and inorganic)

Important for:

- tuning the properties of materials
- services for industry to determine the quality of the organic and/or inorganic materials (chemical and physicochemical properties, thermal, chemical and mechanical stabilities, etc.
- training academic and industrial researchers for specific needs.

Excellent Experiences in:

Nanoporous Materials attractive for:

- Storage / separations of gases and liquids by adsorption/desorption technologies
- Inorganic membranes, attractive for separations and catalytic reactions (membrane reactors)
- Catalysis: high selective catalyst support materials with long lifetime

using natural and/or synthetic nanoporous materials

Natural Nanoporous Materials

Clinoptilolite

purification

Tuning properties for specific applications and economical evaluation

Synthetic Nanoporous Materials

Synthesis

Tuning properties and morphologies for specific applications and economical evaluation

Some important examples using natural and/or synthetic nanoporous materials

Possible Projects

- Controlled product released from nanoporous materials (Clinoptilolite) using as fertilizer (Agrotechnology)

  Advantages: controllably release of organic and inorganic components to increase soil fertility in order to accelerate plant growth. After the release, the harmful elements (heavy metals, etc.) can be removed from the soil, leading to an improvement of the soil structure.

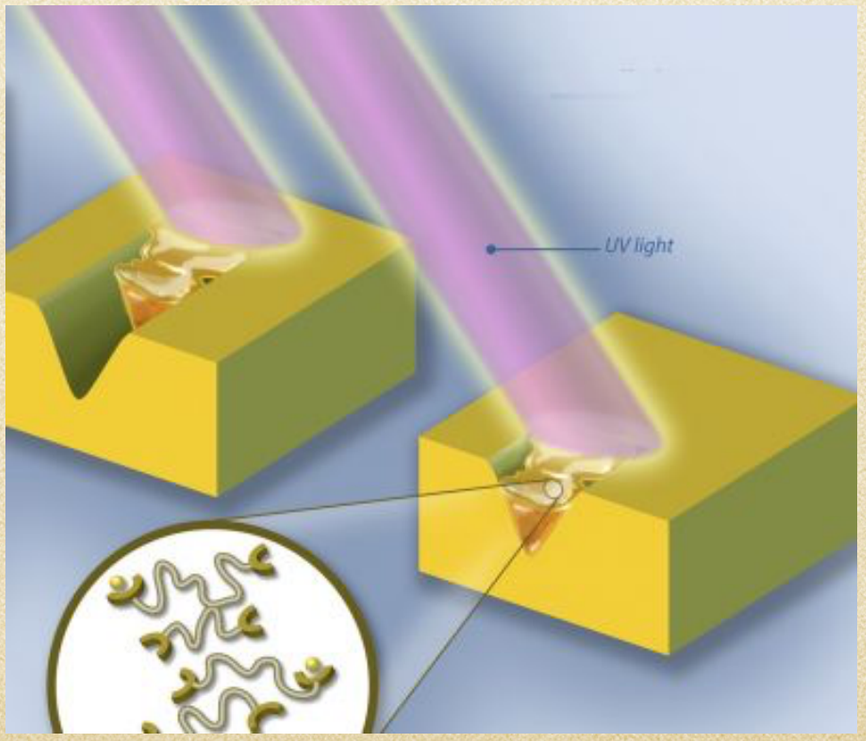
- Controlled drug released in the body (Medicine) (only pure synthetic nanoporous materials can be used)

- Removal of volatile organic compounds (VOCs - used in the composition of paints and coatings) from air by adsorption.
- Destruction of VOCs by photocatalytic reactions
- Important for removal organic pollutants in tunnels and buildings

- High capacity CO and CO_2 selective adsorbents

- To avoid degradation effects in polymers, self-healing processes can be introduced. It is a combination of detection and repair. Encapsulated healing agents and solid catalysts, both of which are embedded in the polymer matrix.

  Another way is the inclusion of latent polymerization catalysts (inactive until the removal of a polymer - bound ligand)



Possible Catalytic Projects

Improvement of existing catalysts with respect to:

- stability
- lifetime
- selectivity
- process intensification
- energy efficiency
- environmental impact

Conclusion

Based on the SWOT analysis and the research conditions in Greece, an intense collaboration between the regional authorities, industries and academic research potential is urgently needed to stop the brain drain of excellent Greek researchers. Excellent Infrastructure is available in Kavala, but researchers that are well-trained to handle these instruments are not available because of the financial restrictions and the brain drain situation.

Thank you!!!