

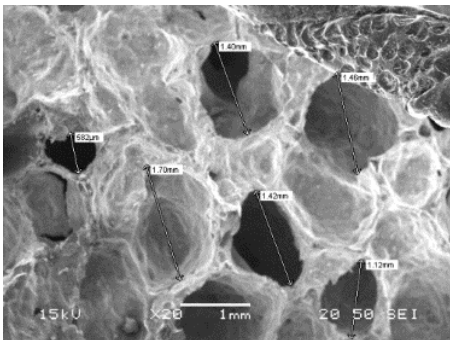


## Overview:

The activities of “Raw Materials Exploitation & Sustainable Energy Solutions” NTUA team are mainly focused on research and technology development in the field of extractive industries, including development of energy efficient processes, processing technologies for ores and industrial minerals, design, simulation and techno-economical and environmental footprint evaluation of new production processes, design of environmental protection processes and synthesis of high added-value materials from ores and industrial minerals. Only in the last 10 years, the team was involved in more than 30 National and European research projects, attracting in total more than 10 million Euros in funding and producing more the 300 scientific publications in international journals and international scientific conferences. The approved research funding of the team for the next 3 years is 6 million euros. Furthermore, the team is a Partner in EIT Raw Materials.

## Raw Materials sector:

The team has gained considerable expertise and reputation in the field of construction materials research, which can be proven from the number of research projects and publications in the field. In LEEMA project the team has developed and tested novel inorganic polymer materials suitable for insulating both new and retrofitted buildings, based on mineral wastes and industrial by-products. In EASEE EU-FP7 project a new, inorganic Synthetic Perlite was developed to be applied as bulk insulation in cavity walls by using mainly mineral wastes, recycled materials and industrial by-products. In the framework of ECO-Binder H2020 project the team is developing a new generation of mortars/plasters, based on common binding systems and innovative insulating fillers, aiming at new, totally inorganic, energy efficient finishing solutions with improved insulating properties and suitable for applications where fire resistance is a prerequisite. Significant results were also obtained through its participation to NU-ROOF and Cool Coverings projects targeted on the improvement of the NIR reflective properties of covering materials, by developing paints and coatings for roofs and facades.



In the field of extractive industry the team coordinates EURARE EC FP7 Collaborative project for the Development of a sustainable exploitation scheme for Europe’s Rare Earth ore deposits and SCALE H2020 project for the Production of scandium compounds and scandium aluminium alloys from European metallurgical by-products. The team also participates in H2020 projects like ENSUREAL: Integrated cross-sectorial approach for environmentally sustainable and resource-efficient alumina production and SIDERWIN: Development of new methodologies for industrial CO<sub>2</sub>-free steel production by electrowinning.

The team is a member of the EIT Raw Materials community with current participation in 9 funded projects while in Horizon2020 the team participates in 5 projects (Minland, MIREU, MIN-GUIDE, SCREEN, MSP-Refram) related to policy guidance and networking. Team leaders have an active role in the sector through their participation on the Ad-Hoc working group of SHERPA Group on the Raw Materials Score Board, being a member of the ERECON group and of the Operational Group 1 of the EIP on RM.

## Energy efficient processes

The team operates an energy self-sustained building H2Sus (525 m<sup>2</sup>) with zero CO<sub>2</sub> emissions, which is harvesting energy from RES and stores it in high pressured H<sub>2</sub>, based on an intelligent hybrid energy system. The building is situated in Lavrion Technological Park which hosts two solar parks, wind generators and battery storage banks. In the local district the team has installed intelligent energy monitoring equipment and BMS at two buildings for evaluating technological solutions for sustainable energy management. These facilities enabled the successful implementation of H2SusBuild FP6 project and AMBASSADOR (FP7-2012-NMP-ENV-ENERGY-ICT-EeB) Autonomous

Management System Developed for Building and District Levels research project. During this period a SmArt Bi-directional multi eNergy gAteway (SABINA), Horizon2020 project is planned to implemented on the site. At the University Campus in Athens, the team operates and evaluates a demonstration plant with customizable size PV modules installed under the framework of Construct- PV, (FP7-ENERGY-2011-2)

## Life cycle assessment

The team provides also life cycle assessment (LCA), cutting-edge services in environmental foot printing, eco design, sustainable supply chains and environmental communication by using SimaPro and GaBi software. For example in LoCoMaTech (H2020) project a Low Cost Materials Processing Technologies for Mass Production of Lightweight Vehicles is going to be evaluated through LCA. In ENTHALPY (FP7) LCA was combined with Process System Engineering for the dairy production chain for 16 possible routes combining conventional and innovative technologies. LCA studies were applied to ECOSTONE (LIFE+ 08 EN), AXIOMA (NMP-2008-4.0-8), I-STONE (FP6-2003-NMP) and LICYMIN (EC Growth, 2000).



## Facilities and equipment / or services

Team laboratories are equipped with modern equipment for:

- **Full physicochemical characterization** using ICP-MS, ICP-OS, XRF, UV spectrometer, XRD, FTIR, SEM, TEM, EDS, TG/DTA/DSC, laser particle analyser, BET specific surface analyser and carbon and sulfur analyser (LECO).
- **Construction material testing** measuring compressive strength, bending strength, thermal conductivity (meets the industry standards ASTM C518, ISO 8301, JIS A 1412, DIN EN 12939, DIN EN 13163 and DIN EN 1266), material testing in climatic chambers, thermal emittance, solar reflectance ( on a UV-Visible-NIR Spectrophotometer, complied with ASTM E903), determination of the solar reflectance index.
- **Mockup testing for construction materials**
- **Raw materials preparation and mineral processing** with jaw crushers for primary crushing, rotor ball mills for secondary crushing, mills for grinding and equipment for screening and separation.
- **Processes upscaling** for insulation/ construction materials and also for pyrometallurgical and hydrometallurgical processes.
- **Engineering simulation** using complementary tools such as TRNSYS, SuperPro, ANSYS and FLUENT.
- **Environmental impact assessment** using dedicated software (Gabi and Simapro) for Life Cycle Assessment, enabling modelling approaches through systems Engineering Life Cycle.

## Team Leaders

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## Few samples of our activities at YouTube:

<https://www.youtube.com/watch?v=4q1KqNQMIRA>  
[https://www.youtube.com/watch?v=sX\\_y17Ob9bAv](https://www.youtube.com/watch?v=sX_y17Ob9bAv)  
<https://www.youtube.com/watch?v=UKsR15S7a1U>  
<https://www.youtube.com/watch?v=4mfZKvpK1UJ>  
<https://www.youtube.com/watch?v=lrr-DGjEY-c>  
<https://www.youtube.com/watch?v=fZPguP1jJuY>

[SCALE, Euronews broadcast]  
 [3<sup>rd</sup> part of the video, H2SUSBUILD, Euronews broadcast]  
 [Enexal Project]  
 [NanoHVAC Project]  
 [Ambassador]  
 [LEEMA]