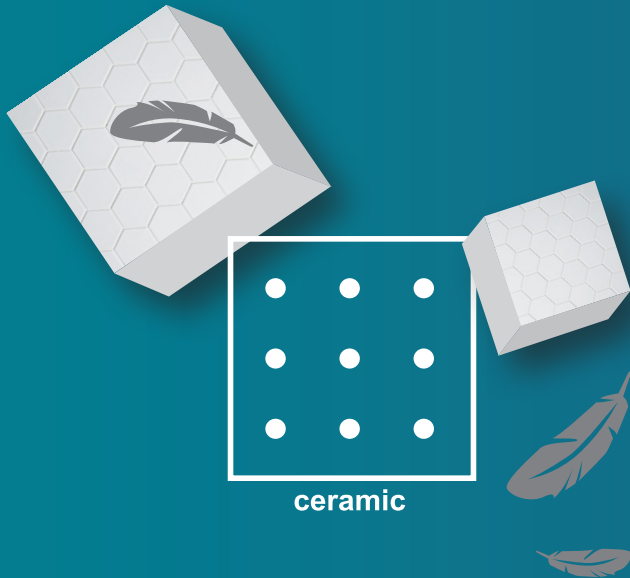




LIGHTCOCE

**Building an Ecosystem
for the up-scaling of lightweight
multi-functional concrete
and ceramic materials and structures**



The Future of Ceramics

Contents

This is the third edition of the newsletter related to the LightCoce Project.

This issue is dedicated to an overview of the ceramics sector, focusing on the main challenges that the industry is facing and on the main solutions developed by researchers, covering innovative and sustainable issues. Moreover, a summary of the dissemination activities run by the partners is made and the main progress made by the project are stated.

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 814632.

LightCoce Newsletter n° 3
October 2020



What is LightCoce project?

LightCoce is a research project funded by the European Community under the H2020 program, with the aim of creating an ecosystem of business innovation capable of upscaling and testing new multifunctional lightweight materials for SMEs.



How LightCoce helps you overcome complex standards and regulations?

Standardization and regulatory compliance are key issues for further exploitation and commercialization of innovations. Testing will be in alignment with international standards (CEN, ISO, ASTM, etc.) and regulatory framework aiming to develop products towards EU standards.



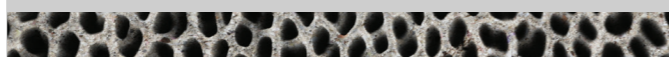
Which is the target market of LightCoce?

LightCoce can address different types of customers such as: Banks, Funds / Investors, Incubators / Accelerators Public Bodies and Owners of Infrastructures Research Institutes / Universities, Large Enterprises, SMEs, Startup / New Ventures, Industrial Associations or Groups, Raw Materials Providers.



Do you need to innovate your business?

Innovation services are open access under specific fees to all parties, such as: development of business model, marketability assessment, suggesting technology to enable your value proposition or embodying it in a product/service in favour of the user, ensuring the proper protection of the IP developed and identifying the funding opportunities at local or EU scale.



Can large-scale modeling help you evaluate new opportunities?

The Modeling Group focuses on process modeling and simulation through the development of holistic models of processes through multi-scale modeling of materials and unitary operations. Moreover, predictive modeling at different levels will be implemented to generate a chain of models that lead to full-scale simulation of real structures, to evaluate the overall performance of solutions at a global level.



Which professionals can benefit from LightCoce services?

The relevant reference markets are different, such as: Construction industry, Bricks and Tiles industry, Aerospace industry, Automotive industry, Defense industry.

The Future of Ceramics

The challenges of Ceramics

Over the years, the concept of “ceramic materials” has radically changed, broadening in a remarkable way. In the last decades, ceramic researches have seen a high-impact transition from a traditional clay-based materials perspective to new complex systems and schemes. From high performant capacitors to superconductors, covering also highly-efficient oxides, carbides, or nitrides of transition metals, the research in ceramics has reached more sophisticated technical levels in a processing and characterization framework. This evolution has strongly encouraged a development in terms of new techniques and scientific instruments with higher levels of accuracy. Nowadays, ceramics represent one of the most relevant industry in the global markets, with a valuation of 229,13 billion in 2018 with a growth projection for the CAGR of 8.6% before 2025. Only in Europe, according to the data provided by the European Commission, the EU ceramic industry is a leader in a worldwide scenario for ceramic manufacturing. The sectors in the European Union provide more than 338 thousand jobs where the vast majority of the manufacturers are innovative small-medium enterprises that have seen important changes and a strong enhancement in the sector’s competitiveness.

The main challenges are related to an increase in mass volumes of low-cost products

that are imported from emerging economies with 70% of the European imports that directly come from China, followed by the US and Thailand. These data represent an interesting aspect if we think that there still are high trade barriers such as tariffs or other schemes related to the testing framework, the certification process, and the limited access to raw materials. The constant need for innovations is leading a transition to more specialized industries and market segments in value-added products in order to access to new markets. Another important aspect is the development of the abilities to offer services designed to be delivered in a *just-in-time* and in a *just-to-market* way.

Ceramics Innovation and Sustainability

The past 15 years of innovation and development in the ceramic sector have led researchers to a crossroad with very different and complicated challenges still open for the forthcoming years. The sector is strongly increasing the research and development effort in technical ceramics and smart materials, with more automated processes that cover labelling and the use of lasers. According to the academic community, one of the most relevant subjects of the scientific debate is still the mechanism by which the modifications of the properties of the materials take place. In fact, even if the most widely known and cited possibilities

are the modification related to the site-blocking or to the bonding, these are not the only ones. Recent studies have emphasised that the change in the grain boundary can be the cause of the existence of a threshold stress for superplastic behaviour.

One of the main industry goals, according to Domínguez-Rodríguez and Gómez-García (2016), is to create new types of ceramics rather than modifying existing ones covering changes in aspects linked to materials composition or processing. A complex challenge that will require an increase in the attention paid to computation on target compositions and synthesis strategies by merging the synthetic chemist and ceramist. This framework will definitely make these materials as potential candidates for a huge variety of structural applications, in particular for the high-temperature ones, covering several employments in very different areas including hypersonic vehicles, engines, plasma arc electrodes, fusion first walls and diverters, furnace components, cutting tools, and high temperature shielding.

This systemic and comprehensive framework bring out several issues related to the sustainable pattern. The production processes in the ceramics sector are energy-intensive and the biggest energy consumers are the players in the bricks and roof tiles sector. However, in the past twenty years, the energy consumption of the industry has been halved thanks to a switch in the fuel

usage during the production phases in which ceramics are fired or spray dried. The sector is still facing several sustainability issues in which different efforts in terms of research and developments will still be required in the next few years.

Sources:

Domínguez-Rodríguez, A., & Gómez-García, D. 2016, "The Future of Research in Ceramics in the XXI Century". In *Key Engineering Materials* (Vol. 663, pp. 127-132), Trans Tech Publications Ltd.

European Commission."Ceramics". In *Internal Market, Industry, Entrepreneurship and SMEs*. Available at: https://ec.europa.eu/growth/sectors/raw-materials/industries/non-metals/ceramics_en

Steyer, T. E. 2013. "Shaping the Future of Ceramics for Aerospace Applications".In *International Journal of Applied Ceramic Technology*, 10(3), pp. 389-394. DOI 10.1111/ijac.12069



230

**Billion of Dollars:
the global ceramics market value**




8,6

Percentage of segment growth



30

**Percentage of the output of tableware
and tiles exported outside the EU**



338

**Thousand:
jobs that the ceramic sector
provides in EU**

27,8

**Billion of Euros:
the ceramics production value in the EU**



1034

**Million Square Meters:
consumption of ceramic tiles in the EU**



European Commission."Ceramics". In *Internal Market, Industry, Entrepreneurship and SMEs*. Available at: https://ec.europa.eu/growth/sectors/raw-materials/industries/non-metals/ceramics_en

LightCoce around the Europe



LightCoce at QUALICER 2020 Congress

Keraben and ITC presented the LightCoce Project during the QUALICER 2020 Congress the World Congress on Ceramic Tile Quality in Castellon (Spain). The Congress involved not only the quality of the process, the product, and tile installation, but also the quality of every element connected to the complex network of the ceramic business world.

The Autors F.J. García-Ten, E. Bannier, C. Segarra, M.C. Bordes, P. Gómez, and L. Guaita discussed a presentation named “Lightcoce. Construyendo un ecosistema para el escalado de materiales de construcción multifuncionales y ligeros” (“Lightcoce. Building an Ecosystem for the up-scaling of lightweight multi-functional concrete and ceramic materials and structures”).

More info on:
<https://www.qualicer.org/en/>.



LightCoce at the XXXVII annual meeting of the Spanish Fracture Group and at the 1st Virtual European Conference of Fracture

Javier Gomez (ADVANCED MATERIAL SIMULATION SL) virtually presented a conference paper named “Machine learning application to mechanical and fracture material characterization” at the XXXVII Annual meeting of the Spanish Fracture Group (Grupo Español de Fractura, 2020) in Coimbra (Portugal).

He mentioned the LightCoce Project and he proposed an inverse analysis methodology to combine experiments and simulation to determine materials properties. This is an original methodology that could be used in some TCs of the project or with future clients. In the 1st Virtual European Conference of Fracture (between June and July 2020) Javier Gomez also mentioned LightCoce virtually discussing a paper named “An extension of the Equivalent Material Concept applied to fracture of U-notched solids”, establishing a methodology to analyze fracture of notched solids in plastic material that could be used within the Project.

The full presentation can be found at the following YouTube link:
<https://www.youtube.com/watch?v=qqmhE-eZBhk&feature=youtu.be>

Welcome to LightCoce partners 4 / 26 - third group



ZERO-E

Zero Emissions Engineering is a leading engineering and technology company that inspires innovative solutions in two main areas: Green Buildings and Cities and Sustainable Processes. Operating across a range of innovative low-carbon sustainable technologies, ZERO-E's capabilities cover everything from project planning to construction and from operation to reuse throughout the project life cycle to achieve target sustainability ratings and benchmarks.

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FIW Munich

The FIW Munich is a research institute and a testing, monitoring and certification authority for insulating materials, building materials and building elements. The institute's main clients are manufacturers of insulation materials, building materials and building components. FIW's R&D activities are oriented towards meeting the requirements of industry and connecting together applications-oriented research and the practical implementation of new ideas, science and industry but also science and society.

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HFT

Hightech Engineering (HFT) core business is the design, manufacturing, testing and integration of mechanical components to be used in sectors like space industry, automotive and robotics. They also provide support and consultancy for the development of new technical products for the market. HFT main activities are in the research and development of high-tech solutions and in the technology transfer based on the know-how gained from experience in the fields of High Tech.

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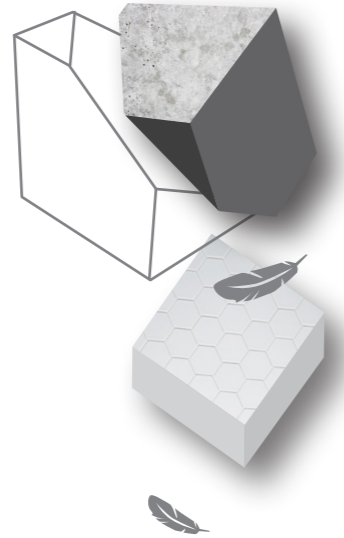
IDENER

IDENER is a research SME that investigates in the multidisciplinary field of Computational Science and its application to the optimization of systems and processes in key areas: Industrial Technologies; ICTs; Biotechnology; Energy; and Resource and Raw Materials Efficiency. IDENER integrates concepts from four interrelated and complementary areas: Mathematical Modelling and Simulation; Multidisciplinary Design Optimization; Control Engineering; and Software Engineering.

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Inspiration



**“The fundamentals
of ceramics is based
on functionality”**

Elizabeth Moss

Connect with us!

Are you eager to know more
about the state of the art of lightweight
concrete and ceramics?

Are you a professional or a company
providing services that LightCoce
might need?

Are you an expert in the field
of lightweight materials?

Contact us to share your
feedbacks and ideas
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