The CEM-WAVE project strives for introducing Ceramic Matrix Composites (CMCs) in European industries through an innovative Microwave-assisted Chemical Vapour Infiltration (MW-CVI) technology. With a significant reduction in production times and costs, MW-CVI makes the use of CMCs increasingly sustainable for a wide range of energy-intensive sectors, with tangible benefits from both an environmental and a manufacturing standpoint.

CEM-WAVE's main objectives:

1. Optimise the Microwave-assisted Chemical Vapour Infiltration (MW-CVI) technology to produce non-oxide and oxide-based CMCs, including coating and joining;
2. Harness CMCs' dielectric properties to optimise their use as sensors, both to determine the optimal MW-CVI processing conditions and to monitor their utilisation in radiant tube furnaces, in combination with infrared imaging and electrical analysis;
3. Build and validate a small-scale version of a CMC tube to display improved properties compared to current alternatives;
4. Bring the solution to market, making it a long-term sustainable method, thus acting as a leader in applying circular economy principles in energy-intensive industries.

CEM-WAVE's expected impact:

Given the needful transition from traditional to renewable energy sources, CEM-WAVE will produce CMCs-based tubes and validate them inside radiant tube furnaces, currently used by the steel industry. Given CMCs' higher service temperatures and longer lifetime, the project estimates an energy efficiency improvement of about 30%, extending the equipment's lifespan by 20%. Using state-of-the-art Life Cycle Assessment methods, CEM-WAVE will demonstrate how transiting to this ground-breaking process could reduce CO2 emissions from radiant tube furnaces by at least 20%.

Partners:

Linked Third Parties:

Project page in Cordis
https://cordis.europa.eu/project/id/958170

Project web
https://www.cem-wave.eu/

@cem_wave

cem-wave

info@cem-wave.eu

SCAN ME

Contacts:

Andrea Lazzeri
Project Coordinator
Università di Pisa
+39 050 2217807
andrea.lazzeri@unipi.it

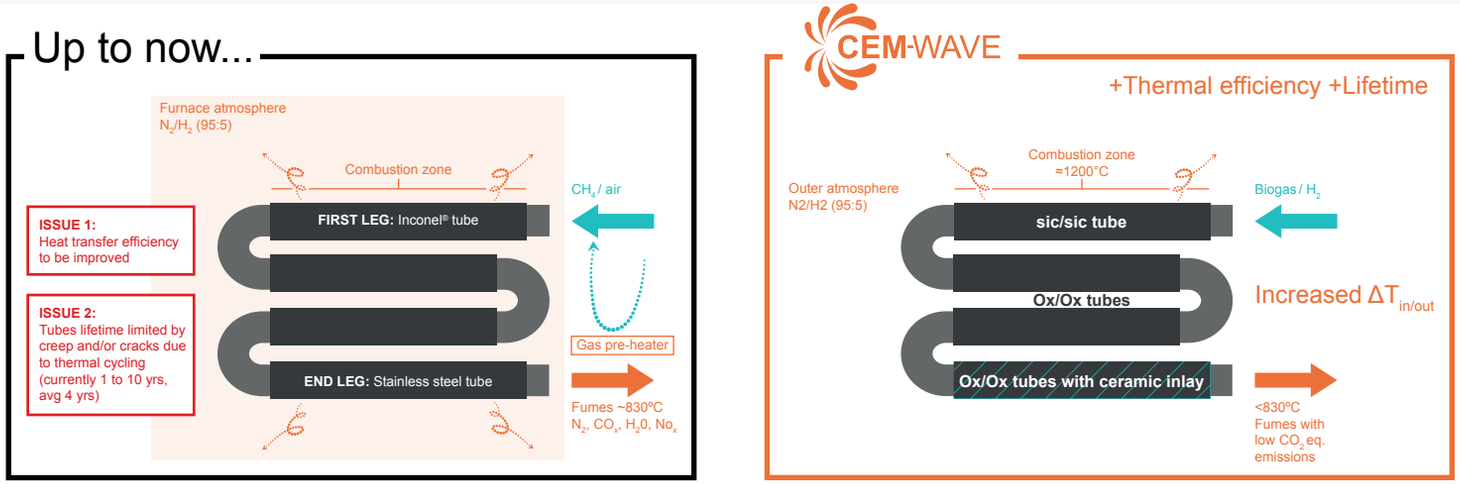
Cristina Barragan
Dissemination, Communication & Exploitation Manager
KNEIA S.L.
cbarragan@kneia.com

CEM-WAVE

NOVEL CERAMIC MATRIX COMPOSITES PRODUCED WITH MICROWAVE ASSISTED CHEMICAL VAPOUR INFILTRATION PROCESS FOR ENERGY-INTENSIVE INDUSTRIES

Project Coordinator:
Università di Pisa (Italy)
Overall project budget:
€ 4.878.720
EC contribution:
€ 4.878.720
Call:
H2020-NMBP-ST-IND-2020- single stage
Topic:
LC-SPIRE-08-2020 - Novel high performance materials and components
Funding Scheme:
RIA - Research and Innovation action
Duration:
01/10/2020 – 31/03/2024 (42 months)

The CEM-WAVE project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958170



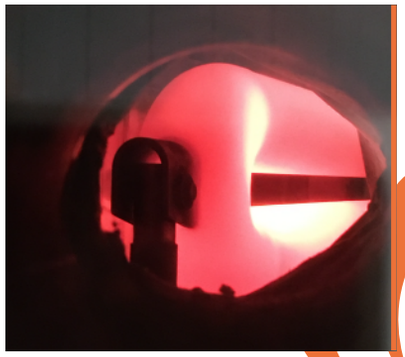
This image illustrates a comparison between the radiant tube furnaces currently in use by the industry and the future solution proposed by the CEM-WAVE project.

By Introducing an innovative microwave-based production process for Ceramic Matrix Composites materials (CMCs), the CEM-WAVE project studies a revolutionary approach targeting those energy-intensive industries that are planning to shift to renewable energy sources.

The CEM-WAVE project aims at...

validating an innovative Microwave-assisted Chemical Vapour Infiltration technology to produce CMCs and develop a CMC-based component that will serve to build a small-scale innovative sensor-embedded tube for use in radiant tube furnaces in the steelmaking industry. Beyond validating the microwave-assisted technology, the sensor-embedded CMC-based demonstrator will provide a viable substitute to currently used Inconel/Stainless steel alloys.

The CEM-WAVE use case:



CEM-WAVE will test a small-scale, CMCs-based, sensor-embedded tube in steelmaking radiant tube furnaces.

Technologies explored by the CEM-WAVE project	Technology Readiness Level	
	M0	M42
Manufacturing of ceramic based fibre preforms based on prepregs and filament winding technology	3	5
Coating of non-oxide and oxide ceramic fibres for a viable fibre-matrix interface in CMCs	3/4	5
Application of EBC coatings on CMC to improve life time of components	3	5
Production of SiC-based CMCs by MW-CVI upgraded with solid-state sources	3/4	5
Production of oxide CMCs by MW-CVI upgraded with solid-state sources	3	4
Characterisation of SiC-based CMCs durability and performances in combustion environments	3/4	5
Joining of CMCs produced and monolithic SiC	3/4	5
Monitoring of CMC process and use	3/4	5