Resumen poster 91
ECO-EFFICIENT ELECTRICAL PROCESSING IN ENERGY INTENSIVE INDUSTRY WITH HIGH TEMPERATURE MICROWAVE KILNS: THE DESTINY PROJECT

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Manufacturing sectors provide over €6,553 billion of GDP in EU, representing approximately 21% of the EU GDP and providing about 20% of all jobs (more than 30 million) in 25 different industrial sectors. Sectors as ceramic, where the energy is the 30% of the total cost of the materials and were the control of the process is critical, are demanding processes for eco-efficient and flexible production and using renewable energy. In order to achieve further significant energy reductions in these mature industries, it is necessary to target the most energy intensive parts of the production chain, such as the firing processes.

In this context, the DESTINY project aims to realize a functional, green and energy saving, scalable and replicable solution, employing fully electrical microwave technology for continuous processing of granular materials in energy intensive industries covering some of the raw materials treatment processes of the ceramic, cement and steel industry. DESTINY aims to fill this gap by proposing a novel solution for processing granular solid feedstock based on a new fast production Microwave Kiln Cell (DESTINY module) designed to cover the "material feedstock-firing-product storage" process in a unique clean system, suitable for connection to electricity grids and ideal for industrial down-scaled plants targeted to lean and on-demand production.

To assure a proper transformation, DESTINY is developing a new concept of eco-efficient microwave applicator, combining a specific design that focus the electromagnetic energy in the target materials, together with a more uniform field configuration along the reaction chamber. Studies about materials and microwaves interaction at high temperatures [1, 2] show the advantages of modulating internal wavelength to adapt the signal to the selective heating of the raw materials. This approach will allow raw materials to be efficiently heated despite of their low microwave absorption (loss factor, ε"). DESTINY aspires to introduce the "first-of-a-kind" high temperature microwave processing system at industrial level, offering a variety of vital benefits to energy intensive sectors: reduced energy consumption, lower lifetime operating costs and enhanced sustainability profile.

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