

## A SUSTAINABLE INTEGRATED ROUTE TO CONVERT WASTE PLASTICS TO H<sub>2</sub> AND LOW CARBON LIQUID FUELS

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### ABSTRACT

The management and disposal of plastic waste is an ever-increasing problem, with the EU alone generating more than 29.1 million tons of post-consumer plastic waste each year<sup>[1]</sup>. SURPLAS is a Marie Skłodowska Curie funded project that aims to deliver an integrated solution utilizing plastic waste to generate low-carbon H<sub>2</sub> and liquid fuels, providing a route for the decarbonization of stationary power generation and transport sectors towards a sustainable future. Although there are studies devoted to the gasification of plastic waste<sup>[2-3]</sup>, an integrated solution from feedstock to end use can neither be found in the literature nor in commercial applications. In SURPLAS, different types of plastic waste will be processed, characterized and gasified to produce syngas with high hydrogen content, adjusted H<sub>2</sub>/CO ratios and low tar formation by the optimization of the operating parameters and catalysts to improve gasification performance. SURPLAS proceeds one step forward with the conversion of gasification-derived syngas mixtures towards Fischer-Tropsch (FT) liquid synthetic fuels using advanced nano-catalysts in terms of synthesis and composition. Thus, regarding the FT synthesis, the aim is to optimize the process conditions and identify superior catalysts that enhance the activity and selectivity of the FT process to diesel and gasoline fractions (low carbon fuels) for maritime and heavy-duty vehicle applications. The originality of the overall work lies in the fundamental understanding and systematic study of the complex relationship between polymer type, gasification conditions, catalyst life, and syngas quality, which are essential for the commercial viability of the overall process. The project will simultaneously deliver a step change and innovative improvement in the production of low carbon fuels and plastic waste management.

**KEYWORDS:** Waste plastics, Gasification, Low carbon transportation fuels, Fischer-Tropsch, Catalysts

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