

Valorising emissions from steel-making into sustainable products

European Union awards 21 M€ for demonstration of industrial symbiosis concept between the steel and chemical industry

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To reach the EU 2050 climate targets, a CO₂ emission reduction of 90% is required by the iron and steel sector. To support this sector in reaching its goals, the recently started EU project INITIATE, *Innovative industrial transformation of the steel and chemical industries of Europe*, will demonstrate the conversion of residual gas from the steel industry into valuable products.

In an operational environment, INITIATE will show how residual carbon-rich gas from the steel sector becomes a valuable feedstock for the chemical sector. At the same time, the cost of carbon capture is sustained, leading to a cost efficient decarbonisation strategy. The TRL7 demonstration will combine the continuous production of N₂+H₂ and CO₂ streams, with the innovative ammonia production as a precursor for urea. The project will also conduct a macro-economic analysis and Life Cycle Analysis to confirm the economic viability and the sustainability of the INITIATE process. Driven by the industrial partners, INITIATE will develop a commercial deployment roadmap for technology roll-out.

The INITIATE consortium consists of major steel and chemical industrial players (Arcelor Mittal, SSAB, Stamicarbon, NextChem), functional material suppliers (Johnson Matthey, Kisuma Chemicals), multi-disciplinary research organisations (TNO, Swerim, Politecnico di Milano, Radboud University Nijmegen) and experienced promoters of Carbon Capture and Utilisation (CCU), circularity and industrial symbiosis topics (CO₂ Value Europe). The European Union has awarded 21 M€ through its Horizon 2020 Framework Programme to this TNO led project. INITIATE will demonstrate a novel symbiotic and circular process that transforms residual steel gases into Urea, as a resource for fertilizer and AdBlue production.

Gaetano Iaquaniello, Chairman of NextChem, Maire Tecnimont Group's company for energy transition and one of the main industrial players of the INITIATE project commented:

"The reduction of waste and GHG emissions from industrial processes, as well as the reduction of energy and raw material intensity, are the key objectives of the INITIATE project, that aims to develop and implement technologies for the industrial decarbonization, also increasing energy efficiency. NextChem will bring within the consortium its ability to transform innovative ideas into real industrial processes and plants, thus contributing to the commercial roadmap of the INITIATE technologies."

Pejman Djavdan, CEO of Stamicarbon stated:

"This is an important step forward in the innovation programs of the Maire Tecnimont Group's companies, focused on Green fertilizers in the energy transition to enable the world to feed itself sustainably. Stamicarbon's participation in the INITIATE project fits perfectly in its objectives to develop

more sustainable technologies for fertilizer production. The project represents one of its key environmental targets to substantially reduce the carbon footprint of the urea fertilizer production by means of a symbiosis between the steel and fertilizer industry for re-using captured carbon dioxide and carbon-rich off-gasses from the steel industry. "

Carl De Maré, VP, Group's Head of Technology Strategy at ArcelorMittal stated:

"ArcelorMittal has been researching and developing ways to capture and reuse waste carbon from our steel waste gas for several years. Currently ArcelorMittal is demonstrating different technologies which will already contribute to reduce our Carbon Emissions in Europe with 30% in 2030. We are excited to find out and learn how our steel waste gasses can be converted into fertilizers and how we can contribute to the increasing challenge to feed the growing world populations in a sustainable way."

INITIATE's coordinator, Eric van Dijk, Senior Scientist at TNO said:

"I am honoured to guide this consortium towards the validation of the business case based on the TRL7 industrial demonstration plant, as well as prepare for the first commercial scale plant through the pre-engineering and site identification. I believe we have gathered the right consortium to valorise the residual gases from the iron and steel sector into one of the most important bulk chemicals, ammonia & urea. The strength of the consortium has been evidenced in the Dutch national BOF2Urea feasibility study, and the entire value chain from material suppliers, to technology suppliers and end users are represented. The two technologies that make up the core of the project are the STEPWISE reactive CO₂ separation technology and the advanced ammonia synthesis loop. Moreover, advanced process control strategies are implemented for optimal efficiency. In conclusion, an enthusiastic consortium is ready to make INITIATE a success."

INITIATE officially started on the 1st of November 2020 and it will take 4.5 years to reach all the operational targets. The demonstrators will be located on the premises of Swerim, in Luleå, Sweden. The project builds upon infrastructure and knowledge developed from previously supported European and national projects, including STEPWISE (www.stepwise.eu; EU Ref: 640769), FReSMe (www.fresme.eu; EU Ref: 727504), ERANET-ACT ELEGANCY (www.sintef.no/projectweb/elegancy/) and BOF2UREA (NL Ref: TCCU117008).

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