Turning industrial waste gases into valuable polyurethanes

European research collaboration between steel and chemical industry

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Turning industrial waste gases (mixed CO/CO$_2$ streams) into intermediates for polyurethane plastics for rigid foams / building insulation and coatings

Responding to call: H2020-SPIRE-8-2017

Contributing to

- Circular economy
- Industrial symbiosis
- Carbon productivity
- Renewable materials

EC contribution: 7.75 mln. €

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 768919
The Concept of Open Innovation
Consortium

14 Partners from 7 countries – interdisciplinary and across sector

Leading experts teaming up for an excellent consortium

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Mission

Generate value from the entire carbon from the flue gas stream and thus making carbon productive and the resulting PUR products more sustainable.
A new flexible technology for the transformation of carbon derived for the first time from a CO/CO₂-containing waste and production of value-added chemicals for new sustainable polyurethane applications.

Avoiding resource-intense separation of the gas components before the synthesis by developing a chemo-catalytic process to deal with the complex gas mixture.
- Take full advantage of **catalysis expertise** and **advanced process technology**
- Small **piloting** of the new process (20t/y)
- **Demonstration** of an adjustable process for on-purpose and on-demand tailor-made production of required products, taking into account all variables at the same time:
  - Steel plant flue gases characteristics
  - Material and process parameters
  - End product market requirements

  Full value chain

- **Adaptable** to products, mostly for existing large-scale markets
Methodology

**CO/CO₂**

Steel industry
- Steel production
- Flue gas treatment

**Chemical – Polyol industry**
- Catalyst design
- Process design
- Upscaling

**Polymer industry**
- Insulation boards & Coatings

**Building Blocks / Intermediates**

**Products & Application**

**Industrial symbiosis analysis**
- ArclorMittal
- UNIVERSITEIT GENT

**LCA and economic analysis**
- Extended LCA
- Economic evaluation
- Societal impacts

**Exploitation – Replication – Dissemination**
- Recticel
- MEGARA RESINS
- DEHEMA
- Imperial College London
- Covestro

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Industrial symbiosis

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Replication potential

Geographical distribution of integrated steelworks and refineries in Europe

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Expected impact

- **Green House Gas emissions reduction**
  Reduction of the carbon footprint of PUR intermediates by 20 – 60% CO₂ eq. as compared to today’s PUR products manufactured from crude oil thanks to the re-utilisation of CO/CO₂

- **Conservation of resources**
  Reduce up to 15-36% of petrochemical epoxy compounds and 70% of process energy compared to conventional chemical processes

- **Strengthen steel and chemical industries**
Thank you!

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