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Recent achievements of Industrial Symbiosis in the steel sector

SymbioSteel, as an EU RFCS project, focuses on Industrial Symbiosis, which concerns the use by one company or sector of underutilized resources from another, making those resources last for longer to enhance efficiency and sustainability. It aims to transform the steel sector by promoting collaboration and reducing environmental impact. The project aims to accelerate the adoption of Industrial Symbiosis (IS) in the steel industry, supporting decarbonization and resource efficiency.

SymbioSteel evaluates the outcomes of these industrial symbiosis initiatives by defining and tracking a set of KPIs, which measure progress in areas such as emission reduction, resource substitution, waste minimization, and by-product utilization. It's important to review, consolidate and evaluate recent IS achievements, identify common drivers and barriers, and translate fragmented project outcomes into transferable knowledge. The result from this work can be a valuable reference for stakeholder and a good base for further investigation of future development of IS.

The content in this newsletter is summarized from our published open-access paper: Colla et al., "Recent achievements of Industrial Symbiosis in the steel sector based on the Symbio-Steel project: a review", Matériaux & Techniques, 2026 (Open Access, CC BY 4.0).

Consortium team:

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Background: Why industrial Symbiosis matters for Steel

- Industrial Symbiosis (IS) is a key enabler of Circular Economy and decarbonisation, based on cross-sector exchanges of materials, energy and by-products.
- The steel sector is an Energy Intensive Industry (EII) and a crucial actor for achieving the EU 2050 climate neutrality target.
- IS is not new to the steel sector, but recent decades have seen significant progress driven by technology and policy frameworks.

Recent Technological and Operational Achievements in Steel IS

- High recovery rates of steel slags: nearly 100% for BF slag and over 80% for BOF/EAF slags.
- CO_2 long-term storage through mineral carbonation of steel slags, with reuse in construction and agriculture.
- Steel off-gases are valorised as feedstock for ammonia and urea production, significantly reducing net CO_2 emissions.

Key Drivers and Barriers of Industrial Symbiosis

Key Drivers

- Policy support (e.g. the European Green Deal and the Circular Economy Action Plan)
- Reduction of raw material costs and waste disposal costs
- Geographical proximity and adequate infrastructure conditions

Key Barriers

- Insufficient technological capabilities and data availability
- High investment costs and long payback periods
- Regulatory complexity and lack of inter-organizational trust

AUTHOR:

Han Yu

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Future Directions: Digitalisation and the Evolution of IS

- Digital technologies such as AI, digital twins and simulation models enable advanced IS planning and optimisation.
- IS is positioned as a systemic approach for the future of steelmaking operation, representing a good opportunity to improve sustainability and economic efficiency across different industries/sectors.
- Future research should quantify environmental, economic and social impacts of IS to support decision-making.

Open access article: "Recent achievements of Industrial Symbiosis in the steel sector based on the Symbio-Steel project: a review"

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AUTHOR:

Han Yu