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## Upgrading of low-quality iron ores and mill scale with low carbon technologies

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Iron ore and scrap as raw materials are the base of iron and steel production. Due to the transition from carbon to hydrogen-based green iron and steel production, most current production units as sinter plan, blast furnace and basic oxygen furnace will be replaced by the direct reduction process followed by the electric arc furnace. As a result, recycling routes via BF-BOF-technologies will be cut off and the demand for high-quality direct reduction pellets and scrap will rise. In addition, new by-products from the DR- and EAF-process will emerge, requiring new technologies for upgrading of low-quality iron ores and scrap to avoid lack of raw materials and provide solutions for the EU's Net-Zero-Waste goal.

Considering this, the ongoing project TransZeroWaste focus on e.g. upgrading low-grade iron ore by combining it with iron-rich by-products, the development of innovative techniques to enhance recycling and produce high quality pre-material for decarbonised future production routes and the separation of disturbing components from byproducts to replace scrap supporting the transition towards zero waste.

Approaches are cold pelletisation and briquetting of low-quality iron ores for direct use in existing and future steel works in combination with new binders, low-CO2 hot pelletisation of fine materials with microwaves as breakthrough technology to increase iron metallisation grade, valorisation of low-quality materials and separation of zinc in parallel and finally the removal of organic impurities like oil from low-quality iron ores equivalents (e.g. oily fine scale), mandatory for an internal metallurgical reuse. The approach is the hydrometallurgical treatment including the cleaning agent recovery using a modified magnetic separator allowing a combined selective removal of iron containing material.

The technology developments are accompanied by investigation and adjustment of digital tools like e.g. mass flow analysis, Life Cycle Assessment and Life Cost Calculation to facilitate evaluation of efficiency for further industrialisation.

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