CarboFuel

Utilization of carbon fiber reinforced composites in pyrometallurgical oxide systems

Duration: *01/2023 – 09/2026*

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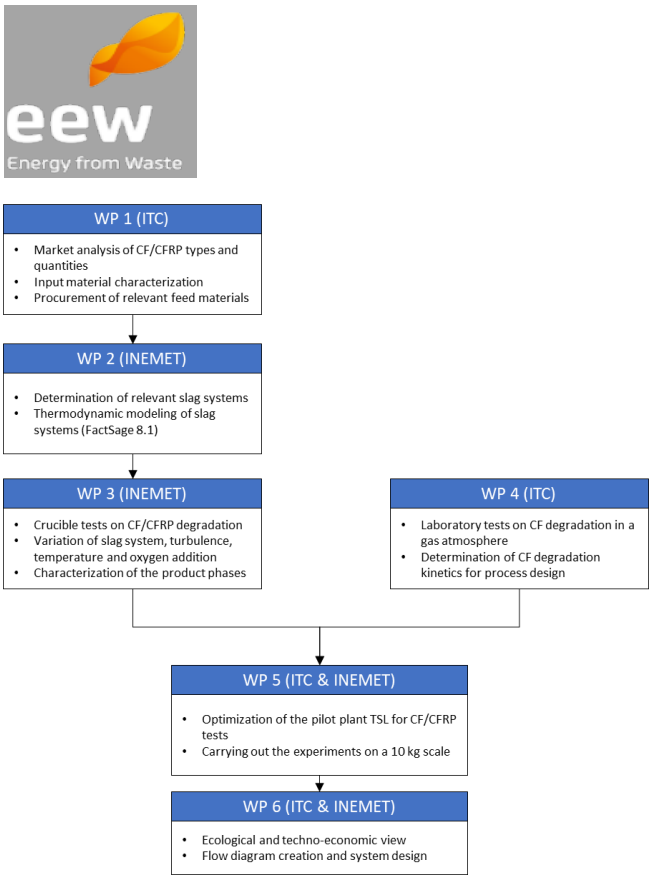

Carbon fiber reinforced composites as an important component of modern lightweight construction applications in aerospace, wind energy and mobility (automotive) are experiencing a steady increase in demand. However, there is currently no disposal pathway for end-of-life (EoL) waste containing carbon fibers, and this problem is expected to worsen in the future, as production waste currently predominates and EoL waste streams are expected to increase in the coming years.

Metallurgical processes with high temperature and residence time as well as high turbulence may be suitable for CF or CFRP recycling, where CF or CFRP containing materials can be used as reducing agents, thus substituting fossil reducing agents, reducing costs and reducing emissions. Classical metal recovering processes are jointly investigated by INEMET, ITC and metallurgical companies.

The project is divided into six work packages (WP) and focuses on the design of a suitable reaction chamber that is optimized for CF/CFRP utilization compared to classical metallurgical processes. It is planned to investigate inert and active slag systems under various conditions for their suitability for CF/CFRP conversion as a reducing agent on a laboratory and pilot plant scale.

For this purpose, starting from a research on potential CF/CFRP waste streams, model fibers will first be selected, procured and characterized (WP1). In parallel, relevant slag systems will be identified and thermodynamically modeled (WP2). In AP3, crucible tests with complete characterization of all product phases (slags and captured dusts) are performed. After correlation of the results with investigations in gas atmosphere (AP4), pilot plant investigations are carried out on a TSL reactor in AP 5. Safety concerns in handling such fibrous materials and a traceability of fibers discharged with the exhaust gas will also be considered. By means of a techno-economic evaluation (WP6), recommendations for their thermal utilization will be derived on the basis of the results of the investigations carried out. This also includes process modeling taking mass and energy balancing into account.

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