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Development and Testing of a Hydrogen-Fueled Burner-Injector System for EAF Applications: A Clusters4Future Initiative

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In the public funded project "HyInnoBurn –Industrial Gas Burners"a 450 kW prototype of a hydrogen fueled burner-injector system for use in EAF has been developed and additive manufactured in pure copper. This project is part of the German Clusters4Future initiative, supported by the German Federal Ministry of Education and Research (BMBF).
Uncertainty in the future gas supply (natural gas, bio methane, green hydrogen) is prevented by the fact that the burner-injector can be operated with hydrogen or natural gas and at arbitrary mixing ratios. Burner-injectors of different sizes were tested with different fuel gases as free flame test as well as in a large-scale laboratory furnace. In parallel, the combustion process was simulated based on the URANS equations and the GriMech 3.0 combustion model. High resolution simulations for different mixing ratio between hydrogen and natural gas show the influence on the flame structure, the flame temperature and the species distribution. The results indicate that the operation of an EAF without fossil fuel and without additional CO2 from burners is generally possible. In Phase 2 of this project (02/2025 –01/2028) the 450 kW prototype burner-injector will be scaled up to full size (4 MW) to be used in an industrial 125 t DC EAF. Additional to the design and development of the additive manufactured burner the development of the necessary infrastructure for hydrogen use in an existing plant is a significant challenge.

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