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Preliminary Results on the Melting of Individual Hydrogen Direct Reduced Iron Pellets in a Laboratory-scale Electric Arc Furnace

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Steel industry is currently undergoing a significant transformation, driven by the need to reduce greenhouse gas emissions and move towards more sustainable production methods. Hydrogen-based direct reduction of iron (H-DRI) is a promising alternative to traditional carbon-based reduction methods. The integration of hydrogen-based reduction technologies with electric arc furnace (EAF) operations appears particularly promising for CO2-lean steelmaking from high-quality ore. Contemporary EAF processes already utiliseutilize recycled scrap and DRI as feedstocks, improving material efficiency. While the melting behaviour of conventional carbon-containing DRI pellets has been extensively, detailed information on the melting of H-DRI pellets remains limited.

This present work showcases preliminary results from melting individual H-DRI pellets (reduction degrees 33%, 43%, 68%, and 80%) in a laboratory-scale electric arc furnace. The melting process and arc behaviour are studied using in-situ monitoring tools, allowing the identification of characteristics related to melting behaviour and furnace parameters that affect the melting of individual H-DRI pellets.

This work provides a foundation for future experiments related to H-DRI pellets and laboratory-scale EAF and identified critical parameters for the development of its operating practices.

Keywords: electric arc furnace, direct reduced iron, melting

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