Contribution ID: **52** Type: **Oral presentation (paper for Ironmaking & Steelmaking special issue)**

Effect of bottom-blowing pattern on the motion behavior of HBI at the bath surface in an EAF-typed water model

Monday 11 May 2026 12:10 (20 minutes)

Technological advances in steel production have greatly contributed to industrial growth, yet the steelmaking process still faces a critical challenge: the emission of large amounts of CO_2. Achieving carbon neutrality and transitioning toward a sustainable steel industry require a fundamental shift in production methods that can sustainably reduce CO_2 emissions. In this context, hydrogen-based direct reduction, which utilizes hydrogen as a reductant to produce DRI/HBI that is subsequently melted in an electric arc furnace (EAF), is regarded as a next-generation technology with strong potential to drastically lower CO_2 emissions in steelmaking systems. However, the implementation of this technology requires shifting from the conventional BF-BOF route to an EAF-based process, accompanied by enhancements in the stirring capability of the EAF. Due to the relatively low physical stirring force of EAF, non-uniform energy transfer in the process of melting and separating gangue within the DRI can lead to repeated local melting and solidification. As a result, the iceberg phenomenon occurs, leaving portions of the direct reduced iron unmelted. This condition decreases operational productivity and increases the required melting energy, thereby compromising the operational stability of the EAF. Therefore, enhancing the stirring force within the EAF is essential for stable DRI/HBI melting, and bottom blowing technology has been recognized as a representative solution. In this study, an EAF-typed water model was used to investigate the motion behavior of density-matched surrogate DRI/HBI samples under bottom-blowing conditions. The effects of symmetric and asymmetric pattern of gas flow rate on the motion behavior of those samples were identified. Furthermore, the perfect mixing time was measured under various gas flow rate conditions to determine the optimal operating conditions. These results suggest that controlling the gas flow rate can improve melting efficiency by influencing the motion behavior of DRI/HBI.

Speaker Country

Korea South

Speaker Company/University

Chosun University

Primary author: PARK, Ji Hyeon (Chosun university)

Co-author: KIM, Sun-Joong (Chosun University)

Presenter: PARK, Ji Hyeon (Chosun university)

Session Classification: Ongoing Research in Electric Steelmaking I

Track Classification: EEC 6 - Research and Development: EEC 6.A Ongoing research in electric steelmaking