Contribution ID: **198** Type: **Oral Presentation**

Carburization with methane of different iron-bearing oxide pellets reduced by hydrogen

Tuesday 7 October 2025 11:10 (20 minutes)

To reduce CO_2 emissions in iron and steel production, the industry is transitioning towards hydrogen-based reduction. However, a key challenge lies in the sustainable production of hydrogen, as most hydrogen is currently derived from hydrocarbon decomposition. Additionally, during the smelting of Direct Reduced Iron (DRI) in steelmaking, a certain amount of carbon in DRI feed is beneficial. In this study, hydrogen was used to reduce iron oxides in two iron-bearing pellets, which were quite different in compositions and physical characteristics. The reduction was conducted at 900 ℃, followed by carburization at the same temperature using hydrogen with 10 vol% CH_4 for different durations. XRD, SEM, LECO, and XRF analyses were performed to examine the phase compositions, microstructure, carbon content, and chemical compositions before and after reduction. The results confirmed complete reduction of iron oxides during the reduction stage, and in carburization, DRI mass gains were observed due to the carburization and the formation of cementite and graphite phases. Prolonged carburization led to the decomposition of cementite, further influencing the phases distrubutions and compositions.

Primary author: KAR, Manish Kumar (Norwegian University of Science and Technology)

Co-author: Prof. SAFARIAN, Jafar (NTNU ,Norway)

Presenter: KAR, Manish Kumar (Norwegian University of Science and Technology)

Session Classification: Hydrogen-Based Direct Reduction (H-DRI)

Track Classification: Hydrogen-based Steelmaking