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Biochar utilization in DRI-based EAF steelmaking

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Utilizing biochar in electric arc furnace (EAF) steelmaking has become a crucial step towards reducing fossil CO_2 emissions. The present research examines the interaction between V_2O_5 and TiO_2-containing EAF slag and pinebark-derived biochars, which were pyrolyzed at two different temperatures (600 ℃ and 800 ℃). Optical dilatometry (OD) and thermogravimetry (TG) studies, supported by X-ray diffraction (XRD) and scanning electron microscopy with energy-dispersive spectroscopy (SEM-EDS) characterization techniques, are utilized to elucidate the interaction. OD and TG were conducted by heating the carbonaceous material slag module at a rate of at least 10 K/min to 1500 ℃ in an inert atmosphere, followed by a 30-minute hold. This research focuses on understanding the following aspects of the interaction between the slag and the biochar: (1) the effect of pyrolysis temperature, (2) the effect of biochar structure, and (3) the impact of slag B2 basicity, FeO, V_2O_5, and TiO_2 on the interaction. The preliminary results indicate that (1) the interaction between slag biochar and FeO is enhanced with an increase in slag FeO concentration and reduction in slag B2 basicity, and (2) vanadium is involved in solid solution formation with iron metallic droplets.

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