

Influence of Iron Ore Mineralogy on Cluster Formation inside the Shaft Furnace

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Abstract : Clustering phenomenon of pellets was observed frequently in shaft processes operating at higher temperatures. Clustering is a result of the growth of fibrous iron precipitates (iron whiskers) that become hooked to each other and finally become crystallized during the initial stages of metallization. If the pellet clustering is pronounced, sometimes leads to blocking inside the furnace and forced shutdown takes place. This work clarifies further the relation between metallic iron whisker growth and iron ore mineralogy. Various pellet sizes (6 – 12.0 & +12.0 mm) from three different ores (A, B & C) were (completely and partially) reduced at 985 ^oC with H₂/CO gas mixture using thermos-gravimetric technique. It was found that reducibility increases by decreasing the iron ore pellet's size. Ore (A) has the highest reducibility than ore (B) and ore (C). Increasing the iron ore pellet's size leads to increase the probability of metallic iron whisker formation. Ore (A) has the highest tendency for metallic iron whisker formation than ore (B) and ore (C). The reduction reactions for all iron ores A, B and C are mainly controlled by diffusion reaction mechanism.

Keywords : shaft furnace, cluster, metallic iron whisker, mineralogy, ferrous metallurgy

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