Alert Iron Ore & Pelletizing (February 2016)


2. Effect of temperature on morphology of metallic iron and formation of clusters of iron ore pellets. J. De Alencar, V. De Resende, L. De Castro. Read more

3. Removing tin from tin-bearing iron concentrates with sulfidation roasting using high sulfur coal. Y. Yu, L. Li, X. Sang. Read more

4. Synthesis process and production properties of forsterite-based refractory from iron ore tailings. J. Li, Q. Wang, H. Xu. Read more


Metallurgical and Materials Transactions B, February 2016

The use of metallothermy (MT) and self-propagating high-temperature synthesis (SHS) is considered for processing different geological and technogenic materials. Traditional MT and SHS processes for production of various metals and nonmetal materials are widely known. Another rapidly developing direction is that connected with the use of ores, concentrates, minerals, and technogenic waste products as one of the components of a thermite mixture, both for the treatment of mineral raw by means of MT or SHS resulting in semi-products and for technological, analytical, and ecological purposes.

Effect of temperature on morphology of metallic iron and formation of clusters of iron ore pellets. J. De Alencar, V. De Resende, L. De Castro

The increase of the reduction temperature in direct reduction furnaces has been a recurring tool due to the benefits that it provides to the process. However, its increase cannot be performed without taking into account some considerations, since the sticking phenomenon is directly correlated with it and could lead to permeability problems and reactor performance. An analysis of the formation of pellets clusters at different temperatures was carried out with focus on morphological characterization of reduced materials to better understand the causes and effects of these actions. The results showed a correlation between the morphology of the metallic iron present in the samples and the clustering index. At low reduction temperatures, 1123 K (850°C), the iron formed is eroded and deformed and the cluster hardly remains after tumbling. When forming iron with fibrous structure, 1223 K (950°C), the clustering index increases because of anchor points which make the material to stick together. Finally, under the effect of high temperature and long time, it generates fresh precipitated iron, enhancing the resistance of the clusters so that they cannot be separated.

ISIJ International, January 2016
Removing tin from tin-bearing iron concentrates with sulfidation roasting using high sulfur coal. Y. Yu, L. Li, X. Sang

With the sulfidation roasting process using high sulfur coal, the tin could be removed efficiently from tin-bearing iron concentrates, and the iron phase was reduced to metal iron. The research showed that the tin removal rate increased with roasting temperature and residence time. Different with the phenomena using pyrite as curing agent, deep reduction of tin-bearing concentrates did not cause tin remove rate
decrease. The reason may be that curing rate of tin phases by the SO2 generated from high sulfur coal pyrolysis was higher, and the formation amounts of iron-tin alloy were decreased. The iron phase was mainly reduced into Fe from Fe2O3 and Fe3O4 in the roasting process. Tin content of the concentrates was decreased to 0.056% under the conditions of N2 flow rate of 60 ml/min, roasting temperature of 1 473 K, residence time of 60 min, high sulfur coal addition amounts of 70% and particle size of 200 meshes. The roasting product can meet the standard of BF ironmaking, which requires tin content in iron ores less than 0.08%. The work supplies a new approach for the clean use of high sulfur coal.

**Materials Research Innovations S10, December 2015**

**Synthesis process and production properties of forsterite-based refractory from iron ore tailings.** J. Li, Q. Wang, H. Xu

Forsterite-based refractories were prepared using iron ore tailings as some of its starting raw materials in the study. Forsterite’s synthesis process was also examined at the same time. The crystallization behaviour of synthesised forsterite samples was investigated using differential scanning calorimetry (DSC), X-ray diffraction (XRD) and Scanning Electronic Microscopy (SEM). According to the DSC analysis, the forsterite synthesis experiments were carried out at different temperature of 1423, 1473, 1593, 1673 and 1723 K. The formation temperature of forsterite was determined. A forsterite-based light insulate brick preparation experiment was carried out at 1723 K for 6 hours. The XRD analysis results show that the major phase of the synthesised forsterite-based refractory was primarily forsterite along with Mg-Ferro spinal, and smaller amounts of MgO (periclase). The properties of the synthesised forsterite-based refractory compared well with the value of the industrial forsterite-based refractory. The result indicated interesting potential for iron ore tailings to produce useful materials.

**METEC & 2nd ESTAD, June 2015**

**Development of partially reduced iron production technology in travelling grate.** S. Son, M. Wang, J. Park, H. Jeong, B. Cho

The manufacturing techniques of pre-reduced agglomerate in travelling grate or grate-kiln process have been developing in POSCO. The new process, named POSCO Pre-Reduced Agglomeration process (PosPRA) is based on the reduction of coal containing iron ore briquette in travelling grate. Reduction behaviors of coal containing iron ore briquette under oxidizing atmosphere were measured to estimate the possibility of producing the pre-reduced agglomerate in travelling grate. The control of reduction temperature and oxygen potential in the range 1100-1200oC and below 10 vol%, respectively is very important to increase the reduction efficiency of coal containing iron ore briquette in travelling grate. In pot grate test, the metallization degree and compressive strength of pre-reduced agglomerate are obtained about 55% and over 150kgf/p, respectively. The possibility of producing the pre-reduced agglomerate in travelling grate was confirmed. It was also investigated by softening and melting test that the mixing of pre-reduced agglomerate with sinter as burden materials is effective method to improve the permeability in blast furnace.