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Evolution of the flux combination for pelletization of high alumina iron Ore fines

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Abstract

During mining of iron ore, huge amount of fines is being generated which needs to be pelletized to use them in blast furnace for iron making process. Pellet quality plays a vital role in decreasing coke rate and increasing the blast furnace productivity. Indian iron ores are suffering from high amount of alumina, which is a deleterious constituent in both pelletizing as well as iron making process. Flux used plays a crucial part in determining pellet quality. Silicate fluxes like pyroxenite and olivine shows improvement in high temperature metallurgical properties but still could not met the desired quality due its improper assimilation, and high content of alumina in iron ore. Carbonate fluxes like limestone or dolomite is more often used in pelletization for alternative iron making processes. Thermodynamic modeling and experiments helped in the evolution of the new tailor-made combination of carbonate and silicate minerals which together provides an attractive solution to achieve sustainable pelletizing with desired quality pellets, and substantiated by their microstructures. During firing, the carbonate mineral dissociates and reacts with high alumina iron ore to form liquid bonding phase in the pellet improving its strength at room and low temperatures up to 600oC (i.e., CCS and RDI), while the silicate mineral forms high melting point phase which keeps the pellet quality intact even at high temperatures beyond 1000oC (i.e., Softening temperature). These superior quality pellets improves the productivity by 12%, mitigate the pellet fines generation by 35%, and decreases the blast furnace coke rate, hence low CO2 emissions.

Biography

T. K. Sandeep Kumar is pursuing his Doctorate of Philosophy (Ph. D) from Lulea University of Technology, Lulea, Sweden. He worked as Researcher in Tata Steel Ltd in Iron & Ferro Alloy group of R&D. He graduated as Metallurgical Engineer from National Institute of Technology, Raipur in 2008. Then, he did his post-graduation from India's premium engineering institute - Indian Institute of Technology Bombay (IIT Bombay) in Process Metallurgy in 2010. He has 3 international, 3 national publications and 1 filed Indian patent. His team won the Tata Innovista for two consecutive years, and also Best R&D project.