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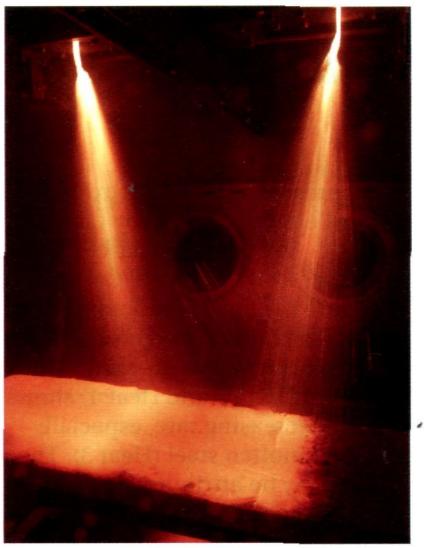

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Cover Photo:

The figure shows the spray forming of a gradient deposit with two sprays of different steels. Further details can be found in the article by Chengsong Cui et.al.

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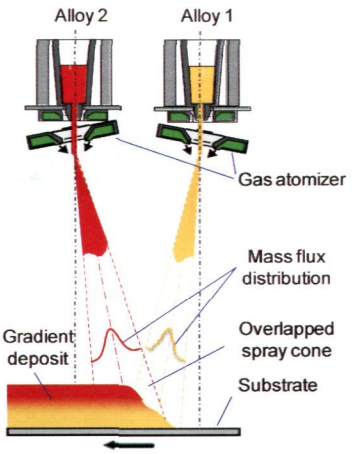
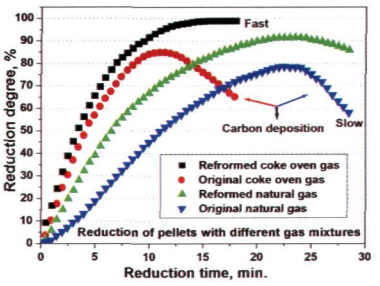
Contents

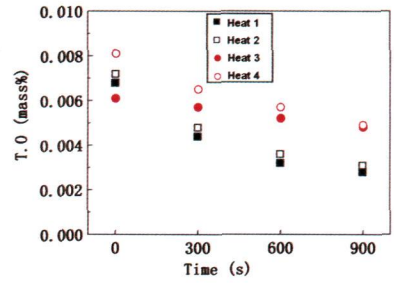


This paper describes a newly developed spray forming process for the manufacture of graded materials. In this process, two different tool steels are atomized simultaneously and co-sprayed on a flat substrate, resulting in a flat graded deposit when the two sprays are overlapped. By the use of the new co-spray forming process, different microstructures and properties can be combined in a single deposit.

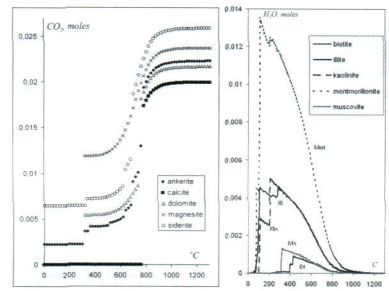


The utilization of coke oven gas for production of DRI in the integrated steelmaking route is considered as an efficient method to maximize the efficiency of the process. In this study, pellets are isothermally reduced with simulated original and reformed coke oven gas at 700–980°C. The results are compared with those obtained by the reduction of pellets with natural gas.

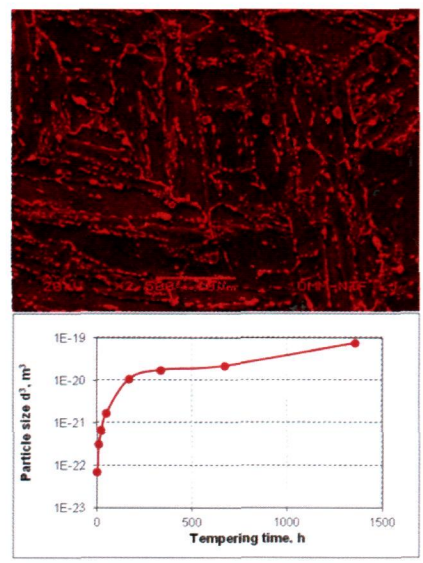
Contents



In the present work, the reoxidation of Al-killed molten steel by the Fe_2O_3 and Cr_2O_3 in the magnesia-chromite refractory is investigated. Compared with pure magnesia refractory (Heat 1 and Heat 2), total oxygen content of steel in the magnesia-chromite refractory (Heat 3 and Heat 4) shows a lower decreasing rate, especially in low Cr molten steel (Heat 3). The reason may be attributed to the reoxidation by Fe_2O_3 and Cr_2O_3 in the magnesia-chromite refractory, and low Cr content in the molten steel is favorable for the reduction of Cr_2O_3 in the magnesia-chromite refractory.



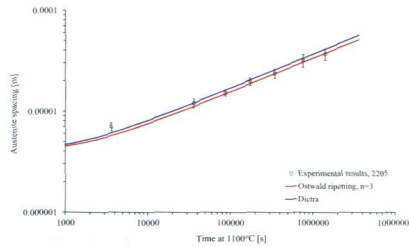
For each ton of coal, containing 1 wt% of carbonates, there will be c. 17.6–22.0 m^3 of CO_2 at the stabilization stage of the coking process. The amount of H_2O released by each ton of coal containing 1 wt% of phyllosilicates, can be approximately 0.88–9.68 m^3.



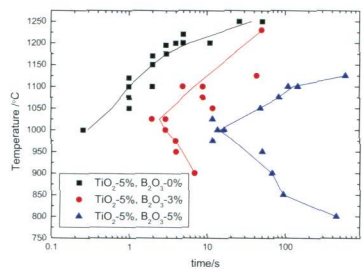
The coarsening rate of carbide particles at 800°C is determined experimentally and calculated. By substituting in LSW equation molar carbide content with atom content of chromium in solid solution, the difference of both rates is lower by 2 orders of magnitude. It is confirmed that the smaller difference is due to the shorter diffusion time for chromium atoms from solid solution than from decomposing carbide particles.

Contents

Mixture of waste iron oxide fines and lime fines are micro-pelletized without binder using CO_2/industrial waste gas at room temperature that can provide a good handling strength. Subsequently, the developed micro-pellets are sintered without using coke breeze. Waste materials itself provides heat for sintering. The produced sinter would be useful as a synthetic flux in basic oxygen process for early formation of oxidizing slag to make refining faster.

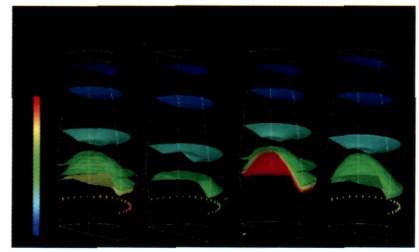


The coarsening of the matrix phases ferrite and austenite in duplex stainless steels, 1000–1250°C and 1–700 h, is investigated experimentally and theoretically. The observed coarsening could be described using Ostwald ripening theory and is also calculated using the Lifshitz, Slyozov, Wagner (LSW) theory and the Dictra software for diffusion and growth in multicomponent systems.

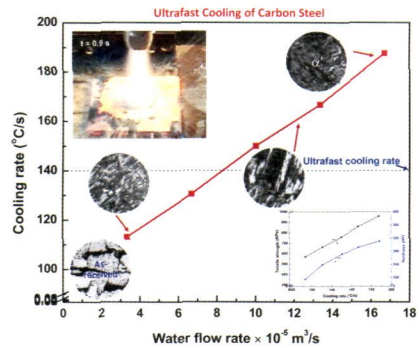


Boron oxide can significantly increase the incubation time for crystallization of slags. Wollastonites ($CaSiO_3$), gehlenite ($Ca_2Al_2SiO_7$), and perovskite ($CaTiO_3$) were observed as crystallization products. There are five morphologies for crystals observed at different temperature. From high temperature to lower temperature, crystal shapes change from equiaxed crystal, columnar crystal, faceted crystal, needle-like crystal to small crystal "clouds."

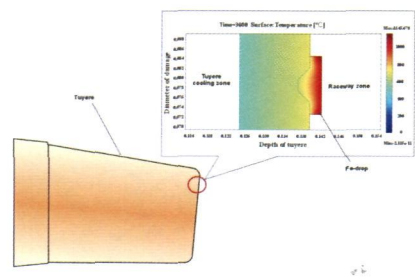
Contents



In this study, favorable control of burden distribution and optimization of packed bed for increasing permeabilityis investigated. The influence of the cohesive zone thickness on gas flow and pressure distribution is calculated using the DEM-CFD model to evaluate the effects of adoption of a thin-layered cohesive layer structure on gas flow and permeability changes in the cohesive zone during low coke ratio operation.



Ultrafast cooling rates greater than 140°Cs^{-1} have been achieved in carbon steels by using a high mass flux air-atomized spray cooling process. These ultrafast cooling rates influence the micro-structural phase transformation in steel resulting in high martensitic phase. Consequently, there is improvement in the mechanical properties of steel when compared to the properties of as-received steel samples. Therefore, this cooling process can be used to produce martensitic steels for high strength applications.



The leakage of blast furnace tuyeres is an unpredictable incident. Investigation is initiated in order to describe the accurate wear mechanism of tuyere erosion. Analyses shows Cu-Fe solid solution formation between tuyere material and the Fe-content of hot metal droplets. A thermodynamic model is prepared for the analysis of the thermal relations between the tuyere and the hot metal drop causing its damage.