

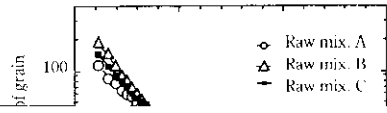
Analysis of Sintering Behavior for Improved Sintering Performance

Synopsis:

The sintering behavior of iron ore pellets was investigated by using a thermogravimetric analysis (TGA) system. The results show that the sintering rate is significantly improved by the addition of a small amount of calcium oxide (CaO) to the iron ore pellets. The improvement is attributed to the formation of a liquid phase during sintering, which promotes the diffusion of iron ions and the growth of sintering necks. The optimal amount of CaO for maximum sintering performance is found to be approximately 0.5 wt-%. The sintering temperature and time also affect the sintering behavior, with higher temperatures and longer times leading to faster sintering rates. The results suggest that the addition of CaO is an effective method for improving the sintering performance of iron ore pellets, which is important for the production of high-quality iron and steel.

Tabela 1. Chemical composition of raw materials

Material	SiO ₂ (%)	Al ₂ O ₃ (%)	CaO (%)	MgO (%)	Fe ₂ O ₃ (%)	Na ₂ O (%)	K ₂ O (%)	SO ₃ (%)	Loss on ignition (%)
Raw material 1	65.2	18.5	10.1	2.3	0.8	0.1	0.0	0.0	3.0
Raw material 2	68.5	15.2	12.3	3.1	0.9	0.1	0.0	0.0	2.9
Raw material 3	70.1	14.8	11.5	2.8	0.7	0.1	0.0	0.0	2.8
Raw material 4	62.3	19.7	9.8	2.5	1.2	0.1	0.0	0.0	3.4
Raw material 5	66.8	17.1	11.2	2.9	1.0	0.1	0.0	0.0	3.1
Raw material 6	69.4	16.3	10.7	2.6	0.9	0.1	0.0	0.0	3.0
Raw material 7	64.7	18.9	10.4	2.4	1.1	0.1	0.0	0.0	3.3
Raw material 8	67.9	16.6	11.9	3.0	0.8	0.1	0.0	0.0	2.9
Raw material 9	63.5	19.4	10.2	2.7	1.3	0.1	0.0	0.0	3.2
Raw material 10	66.1	17.8	11.6	2.8	1.0	0.1	0.0	0.0	3.1



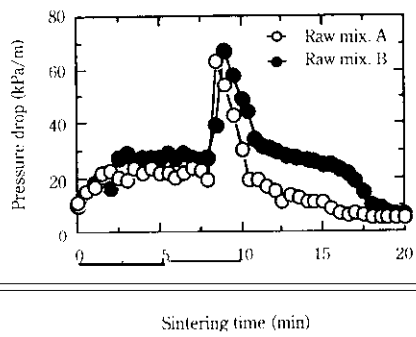


Fig. 7 Changes of pressure drop in sintering bed with blending of pisolitic ore during sintering process

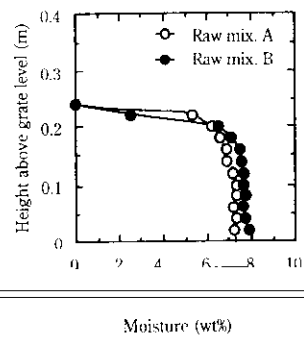
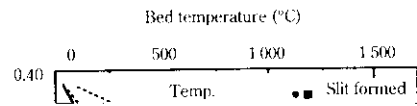


Fig. 8 Moisture condensation in sintering bed with blending of pisolitic ore

The plot of the cumulative value of the average grain diameter and index of melt fluidity falls on the same



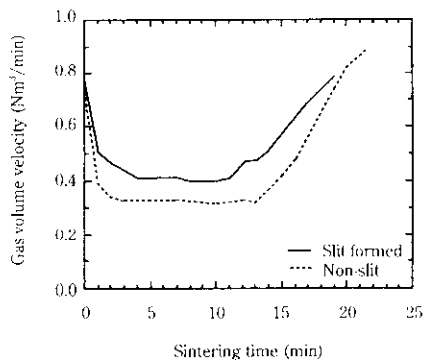


Fig. 10 Change of gas volume velocity during sintering

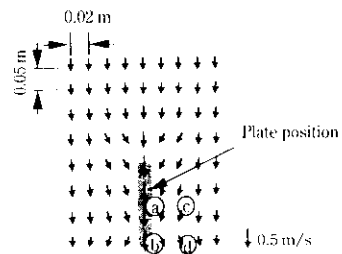
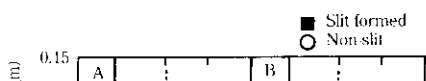


Fig. 12 Calculated velocity pattern of gas flow in the slit formed bed

Here, the following calculation was made assuming that the gas viscosity, μ , is 1.8×10^{-5} Pa·s, the raw material particle diameter is 0.002 m, and the gas density, ρ_g , is 1.3 kg/m^3 .

In the results of the test with the small-scale pot, the

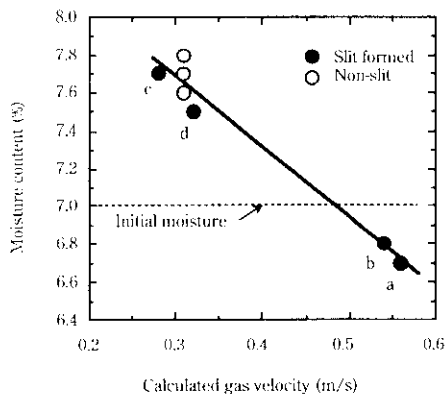
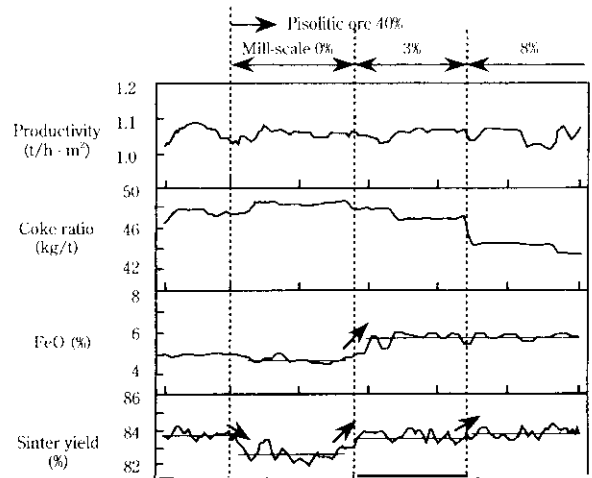
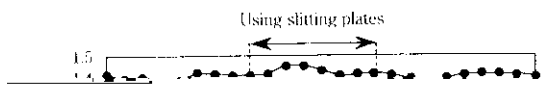


Fig. 13 Relationship between calculated gas velocity and moisture content





in an increase in the gas flow resistance of the sintering bed, which deteriorates permeability.