This inference could also be confirmed by the examination of the magnetic property. In specimen II, even the outermost layer was found to be made up by ferrite contaning 4 % of Al, similarly as in the innermost layer of Specimen I adjoining to the surface of the parent carbon steel. The lines reflected from Specimen III, are deemed to show the presence of the intermediate phase as $FeAl_3$, the lattice type of which has not yet been determined. Such a suppesition seems to be allowable, as the surface of Specimen III, displays some greenish blue colour by pickling in a dilute NaOH solution.

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55. On the Desulfurization in the Hearth of the Blast Furnace.

Hiroshi Sawamura and *Daijiro Kitamura.*

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The quantity of sulphur contained in iron and Steel influences the quality of their products. Desulphurization has therefore been admitted to be important in blast furnace operation, but rarely specified for the fundamental study in the hearth up to date.

The desulfurizing reaction is taken for the following formula.

$$FeS+CaO+C=Fe+CaS+CO$$

H. Sawamura and K. Sawada caluculated for the sulphur equilibrium between molten slag and metal in the hearth as follows:

$$\log (CaS)/[Fes]=\log K_3+\log (CaO)+\log [C]_s-\log P_{CO}$$

$$\log K_3=-7050/T+6.46-\log 87.90/72.14+\log (0.588\cdot 10^{-4}\, t°C-0.0793)-0.05(\sum SiO_2)$$

The above has proved that the desulphurization in the hearth was influenced by the quantity of $(\sum SiO_2)$, (CaO), $[C]_s$, P_{CO} at a constant temperature. We shall determine the relation between P_{CO}, slag components and pig components which infulence the desulphurization.

2) Sample.

A. metal: High carbon pig iron with nearly no impurity.

B. slag: molten range of Al_2O_3–SiO_2–CaO system when containing 10 % Al_2O_3 is 0.4~1.2($\sum CaO/\sum SiO_2$) at 1400°C. Accordingly a series of five slags containing 10 % Al_2O_3 and 1.5 % S was melted in a graphite crucible.

3) Experimental Apparatus and Procedure.

Putting a graphite crusible charged with 5 gr slag, 12 gr pig iron and a proper quantity of metallic Si, into a high Aluminium Tammann tube (vacuumed) in a

cryptol furnace and the tube is closed by water-jacket and 100cc/min purified CO gas is fed therein. The furnace is heated and kept at 1400°C for 3 hrs. The sample is quenched into water and the equilibrium component is determined.

4) Reslts.

The experiments indicated that the sulphur equilibrium attained in 30 min. while Si equilibrium in 90 min. Thus the latter was found to need much more time than the former. Since the time depends on the viscosity and slag components, 1400°C was maintained for 3 hrs. in every run.

The experiments with various slags have proved that with the increase of basicity (S)/[S] increased, $[C]_s$ also increased and [Si] decrease.

The quantitative correlation among (S)/[S], $[C]_s$, [Si] and basicity is not diter-mined from these results, but will be given by further experiments.

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56. A Study on the Decarburization of White Cast Iron. (I)

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(Sawamura Laboratory)

This report is on the fundamental study for the method of a quick decarburization of white cast iron which clarified the relation between casting conditions and the decarburization velocity. White cast iron (C, 2.81 %; Si 1.20 %; Mn, 0.62 %; P 0.21 % and S, 0.20 %) is melted in the Kriptol furnace, kept at the maximum temperature 1450°C for 10 min., and cast in the metallic, the green sand and the dry sand moulds at 100°C, 50°C and 10°C higher than the liquid temperature 1285°C respectively. Each of 9 samples (6 mm×50 mm) prepared as mentioned above is devided into two pieces, one being used for the microscopic study of as-cast structures and the other for the decarburization study. A piece (6 mm×24 mm) is placed in a porcelain boat, covered with mill scale which weighs about 68 % of the test piece and heated in the porcelain combustion tube previously displaced by the dried air and the volume of the gas generated at 1050°C is measured at certain intervals. The degree of the decarburization is calculated from the total volume of the gas, which is presumed to be consisted of carbon monoxide and carbon dioxide.

The volume of the gas generated is remarkably large for 3-4 hrs. from the start of heating, then gradually decreases and yet substancially large for about 9 hrs., until considerably decreases after about 10 hrs. and finally bocomes constant every further hour. The results obtained are shown in the following table: