Basic Parameters of Desulpurization Process of Metal by Regenerated Modern Blast Furnace

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Abstract:
The study of Basic Parameters of metal by regenerated modern blast furnace is presented: In this work, by method of Mathematical Modeling, we have studied the evaluation of the distribution rate coefficient of sulphur between slag and metals and the left over content of sulphur in the regenerated slag and its disbursement. The results obtained by Mathematical Model showed that regenerated slag can be a basis for smooth process and adequately effective slag forming mixture in the ladle.

Keywords: *Modern blast furnace; Mathematical Modeling; Distribution rate coefficient; Liquid Pig Iron; Steel; Regenerated slag.*

INTRODUCTION:

In contemporary metallurgical practice, there is precise requirement on the content of sulphurin prepared steel, especially in case of continuous casting. One of the effective methods for resource conservation of furnace desulphurization of metal of massive usage is the repeated use o degenerated desulphurized blast furnace slag. The major condition for their regeneration is the creation of oxidizing atmosphere [1}. Previous research [2] showed that the acceptable result, for practical purpose, can be obtained if in the regenerated slag left over sulphur is not more than 0.2% and if it is charged in ladle together with lime as a slag forming mixture in the ratio of slag to lime ration of 4:1.

The most important parameters of the desulphurization process of metal with regenerated blast furnace is distribution coefficient of sulphur between slag and metal, the left over content of sulphur in the regenerated slag and disbursement. The calculation of distribution coefficient Ls =(S)/[S], between the slag and the metal can be based on the formula [3]

METHOD

$$\mathrm{LgLs} = \mathrm{Lg\ C}\ \frac{3683}{T} + \quad + 1.226F\ \mathrm{Lg\ F[S]}\ Ə(fe0) \qquad (1)$$

In which Cs= Sulphur Capacity of slag; T= absolute Temperature; for the activity of sulphur in metal; Ə(fe0) = activity of iron monoxide in slag. On the other hand, in the case of blast furnace slag, the following relationship holds [4].

$$\mathrm{LgCs} = -5.54 + 1.35B + 1.58\ X\ 10\ -3\ (t-1500); \qquad (2)$$

$$B = \frac{(CaO + 1.42\ (MnO) + 0.69)\ (MgO}{0.93\ (Sio_2) + 0.18\ (Al_2o_3)} \qquad (3)$$

Where (CaO), (MnO), (Mg)) and (Al_2o_3) – C concentration of these oxidize in slag, %;
T = Temperature, ^oC.

Experience has shown that after regeneration of blast furnace slag, there is noticeable increase in the content of the iron monoxide. So, during the regeneration of slag obtained from Magnitogorsk Metallurgical Complex it increased, on the average from 0.20 to 0.50%. This coincided with an increase in the activity of iron monoxide in the slag form from 0.006 to 0.015. in this, according to formula (1), value of Ls reduces from 60 to 25. Initial value of Ls may be obtained by increasing the basicity by adding lime to the regenerated blast furnace in the above mentioned ratio. Equation (4) can be basis of determining the consumption of slag form mixture on the basis of the regenerated blast furnace slag and lime (g_{wc}).

$$g_{wc} = \frac{[S]_H - [S]_k}{L(S)_k - (S)_{wc}} \qquad (4)$$

In which $[S]_H$ an $[S]_k$ – The concentration of sulphur in the metal before and after treatment in the ladles respectively, %; S(wc) = sulphur content in the slag forming mixture before use, %. Calculation using equation (4) showed that if the initial concentration of sulphur in the metal is the slag forming mixture is 0.10%, it's consumption rate will be 2.3%; $(S)_{wc} = 0.2$ and $g_{wc} = 2.7\%$

CONCLUSION:

From the study of Basic Parameters of metal by regenerated modern blast furnace presented. We obtained Results by mathematical model which showed that regenerated slag can be a basis for smooth process and adequately effect we slag forming mixture for the desulphurization of pigiron and steel in the ladle.

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