

White Slag

Question

We are an integrated steel works producing long product billets. Can you please provide the chemical composition of "white slag." Can we decrease the pinholes in the steel billet or bloom if the Mn/SI ratio is increased to be greater than 2.5 ? R.T. Iran

Answer

Many thanks for your question. This is the first question *Skull Session* has received from Iran. Currently a geographical band stretching from India to the Middle East is the hot bed of steel production growth. This must mean that the economies are rapidly developing in this area. To answer your question, the white slag has the following general properties:

1. Low FeO + MnO; FeO + MnO weight percentage less than 2 %;
2. High capacity for sulfur;
3. Basic in nature;
4. Fluid slag during ladle treatment.

There are many ways to make a white slag but the most important item to remember is to reduce the FeO + MnO content and keep the slag fluid for sulfur absorption. The exact composition may vary depending on the local availability of oxygen removal agents for the slag or the casting process or the final carbon content desired in the liquid steel. For example, if your steel plant is near to an aluminum refinery you might want to use dross as a slag modifier if you are casting aluminum killed grades. Calcium carbide may be available for FeO+MnO reduction but there may be a risk of carbon pickup. Coke is another choice while some plants use small quantities of FeSi. The recipe is up to the cook.

Just as you remove the dissolved oxygen from the liquid steel, you must also remove it from the slag. If you change the Mn/Si ratio try to remember that pinholes are caused by the evolution of dissolved gases during solidification. Gas evolution occurs when the sum of the partial pressures of $p_{H_2} + p_{N_2} + p_{CO} > 1.05$ atm. Make sure that the pinhole problem is not due to wet alloys, fluxes and refractories or excessive nitrogen gas stirring of the ladles. Never overlook the obvious.