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In decarburization process of stainless steel in converter, precise control of temperature as a function of C and Cr is important. As the oxygen potential to oxidize Cr is very close to that to oxidize C, unless the decarburization operation carry out under the optimum condition, the significant oxidation of Cr occurs. Already, many researchers have been reported about the condition to suppress the oxidation of Cr in low carbon region. On the contrary, in the actual operation, oxidation of Cr occurs not only in the low carbon region but also in the initial stage of the decarburization because of the low temperature. From the thermodynamic calculation, it is obvious that if the Cr content increases before temperature reaches enough high, Cr would preferentially oxidized even though the carbon content is high. It is quite important to understand the optimum condition for the preferential decarburization in this stage as the knowledge about this field is quite poor. This research is carried out to clarify the critical condition of Cr oxidation in high carbon region. To the surface of steel, melted in MgO crucible, Ar-O₂ gas was blown through the alumina tube. A top end cap for a reaction tube was modified to observe the reaction between the molten steel and the top blown gas, using mirror, lens, optical filter and CCD camera. The initial condition of Cr oxidation was determined by this direct observation. The results are summarized as the followings. 1) By direct observation, the formation of oxide particles followed by the formation of thick oxide film was observed. 2) The start of the oxide formation did not affect to the decarburization behavior soon. However, after the start of thick and foamy slag formation, decarburization rate decreased much. 3) In the case of 11%Cr at 1723K, the critical carbon content from which oxide particles was observed (C_p) was close to the equilibrium at $P_{CO} = 1 - 0.8$ and the critical carbon content from which thick oxide slag was observed (C_F) was close to the equilibrium at $P_{CO} = 0.4 - 0.8$. On the other hand, in the case of 18%Cr, C_p and C_F were far higher than the equilibrium at $P_{CO} = 1.0$. These results would indicate that C_p and C_F are not determined by the equilibrium relation.

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