Reply to Comments on “Evaluation of Thermodynamic Activity of a Metallic Oxide in a Ternary Slag from the Sulphide Capacity of the Slag”

Miyuki HAYASHI, Nobuo SANO1) and Patrik FREDRIKSSON2)

Dept. Chemistry and Materials Science, Tokyo Institute of Technology, 2-12-1 Meguro-ku, Tokyo 152-8552 Japan.
1) Nippon Steel Corporation, Shintomi, Futtsu, Chiba, Japan.

(Received on July 12, 2005; accepted on July 25, 2005)

The authors have found that the comments by Professor Emeritus Banya and Professor Hino are completely correct. However, we would like to claim that their discussions for our paper stand on their misunderstandings of our statement although such misunderstandings are actually caused owing to the authors’ inappropriate descriptions. We would like to acknowledge Professor Emeritus Banya and Professor Hino for giving us an opportunity to correct the misleading expressions in our paper and clear up their misunderstandings.

(i) The authors have also recognized that the equilibrium constants for Eqs. (1) and (7) in our paper are not identical. As mentioned in their comments, the equilibrium constant for Eq. (1) in our paper is an immeasurable and only conceptual value. We shouldn’t have used the same notation $K$ as the equilibrium constants in Eqs. (6) and (8) in our paper. We would like to clarify that we haven’t considered Eq. (12) in their comments.

(ii) We have adopted the pure $M_xS$, i.e. Raoultian standard state instead of Henrian standard state as the standard state of $M_xS$. Simultaneously, we have assumed that the activity of $M_xS$ obeys Henry’s law if the $M_xS$ solubility is small, i.e., when the $M_xS$ concentration is below the $M_xS$ solubility, $x_{M_xS}^{MS}$, $Y_{MS}$ is constant ($1/x_{M_xS}^{MS}$) irrespective of the $M_xS$ concentration. Therefore, the same standard states are used for $Y_{MS}$ and $K$ in Eq. (8) in our paper.

In deriving Eq. (12) in our paper, we have neglected the term containing $\gamma_{CaS}$ in the $A_l_2O_3$–$SiO_2$ binary system by assuming that the value of $\gamma_{CaS}$ is unity.