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Rate of Evaporation of Manganese, Copper, Tin, Chromium, and Sulphur from Molten Iron under Vacuum*

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Abstract

The vacuum melting of Fe-Mn, Fe-Cu, Fe-Sn, Fe-Cr, Fe-S, and Fe-Si-S alloys was carried out at 1600°C by using a high-frequency induction furnace. The evaporation of Mn, Cu, Sn, Cr, and S follows first-order kinetics and the specific evaporation constant K^s of each of these elements was obtained. The K^s of sulphur in Fe-Si-S alloys increases with the increase of silicon content. For each of these elements in the binary alloys, the rate constant of evaporation and of transport in melt and the ratio of surface concentration to bulk concentration C^s/C^m were obtained. Furthermore, the evaporation coefficient α of each of these elements was obtained both experimentally and theoretically according to the equation derived by Olette. It was confirmed that for each of these elements in the binary alloys the theoretical value of the product $\alpha \cdot C^s/C^m$ is close to the experimental value of α .

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