Distribution of Various Elements Between Copper, Matte and Slag

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The distribution behaviour of various elements between liquid copper, matte and slag was discussed thermodynamically combining with the experimental results obtained recently. The behaviour of impurities differs greatly depending on the compositions of equilibrating liquid phases and oxygen potential, and the various copper smelting systems were classified in 6 cases for discussion. In accordance with thermodynamic predictions, increasing oxygen potential results in increasing distribution fractions in slag phase for various elements, but any appreciable influence did not be observed in the distribution ratios between copper metal and matte. Under the coexistence of liquid copper phase, substantial fractions of detrimental impurities are distributed in copper phase. Distribution ratios between matte and slag are also influenced by the coexistence of liquid copper or γ-iron phase, especially for arsenic distribution. Because of the differences in thermodynamic characters, the distribution relations for calcium ferrite slag system seem to be different considerably.

Arc-plasma Reduction of Tantalum Oxide with Carbon

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Metallic tantalum is one of the prominent refractory and corrosion-resistant metals. By the conventional production processes,however, tantalum metal powder is produced because of its high melting temperature. The plasma-arc furnace provides a stable high temperature. In this work, the carbon reduction of tantalum pentoxide has been investigated in a plasma-arc furnace.

The sample is a mixture of tantalum pentoxide and graphite, vacuum pressed into a briquette and has been reduced at about 3100°C. Argon has been used as the arc gas. The optimum mixing ratio of carbon and tantalum pentoxide, C/Ta_2O_5 is 5.10 ~ 5.15. The sample, weighing 7 g is fused within 60 ~ 70 seconds by plasma-arc heating and the reduction of molten tantalum oxide with solid carbon proceeds rapidly to approximately 99.5 % Ta during this period. The reduction that follows in the molten state is slow. Within about 10 minutes, the maximum tantalum content of the massive metal product reaches 99.9 % and the oxygen and carbon remaining in the product are 50 ppm and 400 ~ 500 ppm respectively.