Density, Surface Tension and Viscosity of Cu_2S and FeS Melts Measured by Levitation Techniques

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In smelting processes for pyrometallurgy of copper, a matte phase, which consists of molten Cu_2S and FeS, is separated from a slag phase by settling. In this process, a small size of matte droplets suspends in the slag phase, which causes a copper loss. The sedimentation velocity of the suspended matte droplet is described by Stokes law [1]. It indicates that the sedimentation velocity of the droplet is dominated by the densities and viscosities of slag and matte. In addition, adhesion of the matte droplet to SO_2 gas bubbles affects sedimentation phenomenon of the suspended matte droplets in the slag phase. Adhesion of the matte droplet to the bubble depends on the surface and interfacial tension of matte and slag [2]. Thus, thermophysical properties of matte and slag greatly affect the yield of matte production. To design the separation process of suspended matte droplet in the slag phase, accurate thermophysical properties of molten matte and slag are required. In this study, surface tension, density, and viscosity of Cu_2S and FeS melts were measured using a conical nozzle levitation technique, and an electromagnetic levitation technique. The surface tensions of Cu_2S and FeS decreased with increasing temperature. Details of the measurement techniques and results will be presented in the conference.

References

[1] W. G. Davenport et al., Extractive Metallurgy of Copper, forth ed., 2012, Pergamon.

[2] R. Minto et al., Trans. Inst. Min. Metal., 81C (1972) C36.