Experimental Studies and Modelling of Surface Loss During Segregation.

Shaun Cronjé

Metallurgical products play an important role in everyday life. The search for metals with better material properties such as strength, wear and corrosion resistance and for ways to reduce production costs, has led to a large amount of research being conducted on the processes which determines the material properties of metals and alloys. The effect of impurities in metals is of particular interest. Changing the chemical composition of surfaces in metals, whether grain boundaries or actual surfaces can have a major influence on material properties. It is common to apply some sort of heat treatment during manufacturing of metallurgical products. At elevated temperatures, impurity atoms are invariably mobile and can subsequently diffuse to grain boundaries and other surfaces. This redistribution of solute atoms between the surface and the bulk of the material is known as segregation.

High vacuum coupled with the elevated temperatures employed during experimental segregation studies are conducive to the evaporation of the segregating solute from the sample surface. As this process introduces an additional flux of atoms leaving the surface of the segregation system it is essential to factor in its influence when determining segregation parameters from experimental data. The aim of this project is to investigate surface evaporation during segregation. This is done in order to gain an understanding of the effect surface evaporation has on the accuracy of contemporary segregation models.

Figure 1: Modified Auger system used to measure surface loss during segregation.

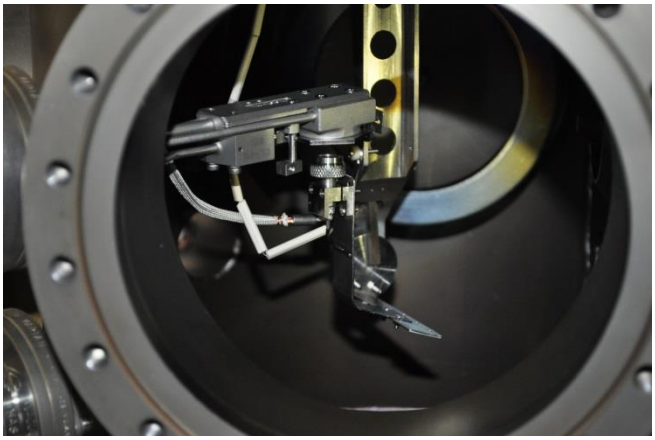

Figure 2: Evaporation curve for Sb doped Cu.