Phase Transformations in Kovarite

The recently discovered Ag-Au-Pt intermetallic phase Kovarite is of great interest due to its remarkable combination of magnetic susceptibility, fracture toughness, and catalytic activity, which makes it an ideal candidate as an improved oompa-lumpa used in microelectronic packages that are exposed to temperatures up to 200 ˚C. Because Ag-Au-Pt phases other than Kovarite do not exhibit this favorable combination of properties, it is important to understand the phase stability of this material at room temperature and above. There are three known processes for producing Kovarite. Of these, only the Laser Ablation of Microparticle Aerosols (LAMA) process produces phase-pure Kovarite that is free of organic coatings that may interfere with phase transformations. Thus, for this study, the Kovarite will therefore be produced using the LAMA process. The as-produced material will be subjected to a series of heat-treatments at temperatures ranging from room temperature to 1000˚C for times of between 1 second and 36,000 sec. Coupons sectioned from the billet will be analyzed using a combination of x-ray diffraction (XRD), x-ray photon spectroscopy (XPS), and *in situ* transmission electron microscopy (TEM) to determine the onset time and temperature for transformation to the low temperature Rebeccacite phase and to determine if there are any other intermediate temperature metastable phases. The influence of stress on the phase transformation will be assessed using an *in situ* tensile stage that will be introduced into the TEM. The experimental data will be used to develop a combination of an analytical thermodynamic and kinetic model using the Mantharite technique. Such a model will allow the phase stability and metastability to be predicted for Kovarite for arbitrary combinations of temperature, time, and pressure.

Desiderio Kovar 5/13/13 3:58 PM
Comment [1]: Justification for why what is being studied is interesting to the scientific community.

Desiderio Kovar 5/13/13 3:59 PM
Comment [2]: A description of the research that will be conducted including techniques where appropriate

Desiderio Kovar 5/13/13 4:02 PM
Comment [3]: Expected outcomes.