

## Knudsen Cell Studies of Ti-Al Thermodynamics

Nathan Jacobson (1)  
Evan Copland (2)  
Gopal Mehrota (3)  
Judith Auping (1)

- (1) NASA Glenn Research Ctr.
- (2) Case Western Reserve Univ.
- (3) Wright State Univ.

The development of a Knudsen cell Mass Spectrometer (KCMS) for measuring thermodynamic activities in alloys is discussed. The measurement of vapor pressures is a valuable method to determine component activities in alloys at high temperatures. Essentially it is simply the ratio of the measured vapor pressure of the element in the alloy to the measured vapor pressure of the pure metal at a given temperature. Most mass spectrometers require a multiple cell configuration, with an *in-situ* pure standard, to make these measurements.

In order to obtain precise data, a number of challenging experimental issues must be addressed. These include:

1. Background subtraction.
2. Contamination of the molecular beams from the vapor inside the heat shields.
3. Identical sampling and ionization of molecular beams emerging from all cells.
4. Accurate temperature measurement.
5. Isothermal conditions within cells and between cells.

We have developed several Knudsen cell configurations to overcome each of these issues. This has been a long process, involving several iterations to arrive at a solution. Issues (2), (3) and (5) are unique to multiple cell configurations and have proven to be the most challenging.

In this paper we discuss our approaches and methods of checking for consistency. Sample data for Ti-Al alloys is presented to illustrate the technique.