

DIPARTIMENTO DI CHIMICA



SAPIENZA
UNIVERSITÀ DI ROMA

Seminario di Dipartimento

Lunedì 18 giugno, ore 11:00, Sala Parravano

Knudsen Effusion Mass Spectrometry at the NASA Glenn Research Center

Nathan S. Jacobson
NASA Glenn Research Center
Cleveland, OH 44135 USA

The NASA Glenn Research Center has been involved in KEMS for many years. We currently have two instruments—a magnetic sector and a quadrupole. These instruments are briefly described. The Knudsen cell flanges are interchangeable and are configured for restricted collimation. A Monte Carlo simulation computer code has been developed to model the restricted collimation sampling on both instruments.

Recent projects will be discussed. These broadly fall into the categories of high temperature materials for aero-engines and geological processes. Silicon-based ceramics and composites are near application in the hot-stage of aero-engines. However a weakness of these materials is volatilization of the protective silica scale to $\text{Si(OH)}_4(\text{g})$. In order to limit this volatility, protective coatings have been developed, which work by lowering the silica activity. Rare earth silicates such as phases in the $\text{Y}_2\text{O}_3\text{-SiO}_2$ and $\text{Yb}_2\text{O}_3\text{-SiO}_2$ systems are currently the leading coating candidates. KEMS is ideal for measuring silica activities in these systems and we show our methods and results.

In geological areas, KEMS has also proven to be a useful tool. We describe some geological dating, based on the K-Ar method, where KEMS is used to measure the K isotopes. We also describe some recent studies on olivine vaporization. Olivine vaporizes to Fe, Mg, SiO, O, and O₂. KEMS derived thermodynamics of olivine is discussed. Other geological applications of KEMS are discussed.