Contribution ID: **130** Type: **Poster Presentation**

Experimental evaluation of emission models from a thermal evaporation source

Wednesday, 1 July 2015 16:10 (1h 50m)

Abstract content
   (Max 300 words)
Formatting &
Special chars

Thermal evaporation is a well-known phenomenon used to produce metallic thin films for many industrial and research applications. Generally the focus is not on the evaporation rate, but the deposition rate which can be measured using a quartz crystal microbalance (QCM). In this study the interest is in the evaporation process, for which well-known models such as the Hertz-Knudsen equation exist but are not always accurate. A novel approach was developed to use the deposition rate on a QCM to study the evaporation flux from a surface. This requires a model for the angular distribution of evaporating atoms in order to link the measured deposition rate to the evaporation rate. The literature generally assumes a point source with a cos<i>ⁿ θ</i> angular dependence and <i>n</i> = 0, 1, 2 corresponding to isotropic emission, cosine emission associated with Knudsen effusion cells and more directed emission, respectively. To measure low evaporation rates the model considers evaporation from a surface placed so close to the QCM that the assumption of a point source is questionable. Since a treatment of the evaporation rate from an extended source was not found in literature, a model was developed by treating the extended surface as many point sources and integrating numerically using MATLAB software. The fraction of evaporated atoms incident on the QCM for point and extended circular sources for <i>n</i> = 0, 1 and 2 are compared. The results also predict how the deposition rate should change with the distance between source and QCM. This is compared to data measured for the evaporation of antimony from a custom designed resistance heater in an ultrahigh vacuum environment to determine the most suitable emission model.

Apply to be
 considered for a student
   award (Yes / No)?

No

Level for award
 (Hons, MSc,
   PhD, N/A)?

n/a

Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?

Yes

Please indicate whether
this abstract may be
published online
(Yes / No)

Yes

Primary authors: Mr CRONJE, Shaun (UFS); Dr KROON, Ted (University of the Free State); Prof. ROOS, Wiets (University of the Free State)

Presenter: Dr KROON, Ted (University of the Free State)

Session Classification: Poster2

Track Classification: Track F - Applied Physics