



**POSTER #19**

## **METAL DIFFUSION ALONG THE METAL-CERAMIC INTERFACE IN PARTIALLY DEWETTED THIN FILMS**

**Hagit Barda, Dor Amram\* and Eugen Rabkin**

Department of Materials Science and Engineering, Technion – Israel Institute of  
Technology, 32000 Haifa, Israel

\* Now at: Department of Materials Science and Engineering, Massachusetts  
Institute of Technology, Cambridge, MA 02139, USA

The established hierarchy of diffusion paths in crystalline solids, in the order of increasing diffusivities, is bulk diffusion, dislocation core diffusion, grain boundary diffusion, and surface diffusion. The position of diffusion along the interfaces between dissimilar materials in this hierarchy is largely unknown. In this work, we aimed at filling this gap by studying the metal hetero-diffusion along the metal-ceramic interface.

In a recent work [1], an indirect evidence for fast self-diffusion of Ni along the Ni-sapphire interface has been obtained. Based on these results, we propose a new method of measuring the metal heterodiffusion along the Ni-sapphire interface. We deposited a 4 nm thick Au film on a partially dewetted 40 nm-thick Ni film which consists of holes (dewetted areas) surrounded by a bi-crystalline film. Afterwards, a diffusion annealing was performed at the temperature of 600°C, at which the morphology of the Ni film is highly stable. Gold atoms diffused from the edge of the holes along the Ni-sapphire interface, and the concentration decay in the direction from the hole edge to the unperturbed film was quantitatively characterized by high resolution transmission electron microscopy. Based on the suggested method, diffusion coefficient of Au along a film-substrate interface was determined.

1. D. Amram, L. Klinger, N. Gazit, H. Gluska, E. Rabkin. "Grain boundary grooving in thin films revisited: the role of interface diffusion". *Acta mater*, 69, 386, (2014).