The relationship between Contact Area and Force in Metallic and Carbon-Nano-Tube Electrical Contacts.

J.W. McBride, E.M Yunus, and Z. Zhao
University of Southampton, UK.

Abstract

The work presented follows an initial study into a method for the 3-dimensional scanning of an electrical contact surface, while in physical contact with a glass plane. The method allows the direct measurement of the contact force and the associated contact area in contact with the glass.

The methodology established is to use a con-focal laser scanner with 2μm spot size and 10nm resolution to measure the contact surface through the glass plane. A centring procedure is used on each measurement to ensure that the contact region is measured, and a data grid resolution of 0.1μm in the X,Y plane is used to identify the contact regions. To determine the contact area a minimum of 3 contact areas are identified which have the same height profile. The contact points are identified and compared with measurements using an AFM probe.

In this study a new test apparatus is presented which allows improved control of the contact force and improved analysis of the contact area. The materials investigated include a Ag contact surface and a multi-walled carbon nano-tube surface. The results are compared to the Greenwood-Williamson model for contact mechanics.