

An Elastic-Plastic Finite Element Model of Asperity Contact with Adhesion

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Thursday, January 18, 2007 at 3:00

MRDC Building, Room 4211

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<http://www.me.gatech.edu/SMSS>

ABSTRACT

A finite element model was developed to study the contact of a micro hemisphere in elastic-plastic contact with a rigid flat. The effects of adhesion on the deformation and stress fields are included using the Lennard-Jones potential, which makes this model applicable to a wide range of the Tabor parameter. Both loading and unloading are considered. Whereas elastic loading/unloading with adhesion is governed by the Tabor parameter, it is shown that elastic-plastic loading/unloading depends on three dimensionless parameters. For a range of these parameters ductile separation can occur. Comparisons are made with a simple analytical model.

The development of an experimental test station for measuring the adhesion forces is also described. This test station cycles the contact tips at a high rate, thus allowing for the monitoring of contact evolution.

BIOSKETCH

Dr. George G. Adams is Professor of Mechanical Engineering at Northeastern University where he has served on the faculty for twenty five years. Prior to joining Northeastern, he was at the IBM Research Laboratory in San Jose, California, and on the faculty of Mechanical Engineering at Clarkson University in Potsdam, New York. His areas of expertise are contact mechanics and friction, with applications to microelectromechanical systems (MEMS) and nanomechanics.

George received his B.S. in Mechanical Engineering from Cooper Union in 1969 and his M.S. and Ph.D. in Mechanical Engineering (Applied Mechanics) from the University of California at Berkeley in 1972 and 1975 respectively. He is a Fellow of *ASME*, an Associate Editor of the *International Journal of Surface Science and Engineering*, and *Microsystems Technologies*. He is *College of Engineering Distinguished Professor* at Northeastern University.

If you are interested in meeting Dr. Adams, please contact Professor Itzhak Green at itzhak.green@me.gatech.edu or Cecelia Jones at cecelia.jones@me.gatech.edu