## Abstract of Keynote Speech 5

# Three-dimensional Contact Analyses with Multi-field Couplings

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**Abstract**

Indentation techniques have been widely adopted to measure the properties ofthin film materials due to various superiorities such as simplicity, accuracy and convenience. The basis of indentation techniques is the Hertz contact theory. Now similar techniques including piezoresponse force microscopes (PFMs) and thermal scanning probe microscopes (SPMs) have been developed to characterize advanced materials with multi-field couplings, but most are qualitative rather than quantitative. The key to quantification of these techniques is to obtain analytical relations like the Hertzian contact solution. In this report, we will show how a few three-dimensionalanalytical contact solutions can be obtained via the generalized potential theory method. These solutions not only provide exact contact relations which could be directly used in material characterization, but also give analytical expressions for all physical field variables at any interior point of the material half-space. These analytical expressions may be used to develop other material characterization approaches along with the indentation techniques.

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