NEW TOOLS TO SOLVE KNOWN PROBLEMS AT CRITICAL NANOINDENTATION MEASUREMENTS

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Key Words: flat-punch geometrical problems, large area frame stiffness homogeneity

The nanoindentation measurement process is a widely used in material science. It delivers very useful information about the mechanical properties with high spatial resolution. Nevertheless the knowledge of the exact contact mechanic with its geometrical conditions of indenter tip and sample surface in the contact area is essential for the accuracy of the results.

Because the indenter geometry is not free of tolerances as well the sample surface is not in the accurate position to the indenter – so corrections are necessary to solve this incorrectness.
The detailed analysis of flat punch force-displacement curves allows to correct the incorrectness of the contact surfaces by aligning the sample surface parallel to the real flat punch surface.

Another problem is related to large area indentation mapping. In the last years some high speed indentation techniques came up which allows the mapping of larger sample areas. In the mm range in most cases no problem exist, but if it comes to several 1000 mm^2 areas the question of the frame stiffness homogeneity over this area becomes an important feature. Any motion of a sample or the indenter head has the result off a local contact stiffness variation. In case of quality control measurements of processed Si wavers, this feature is key to analyze the local device conditions. Any kind of moving elements in this measurement frame is part of the total measurement error.

We are demonstrating manual and automated solution to align the sample to the actual indenter surface. Special for nanoindentation quality measurements on large areas new solutions are presented to control and solve the experimental problems.