Mechanical and tribological characterization of nanostructures inside a scanning electron microscope

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Rapid development of nanotechnology allowed researchers to synthesize a plenty of novel materials and create various nanostructure-based systems with promising applications. However, challenges are related not only to synthesis, but also with subsequent characterization of obtained structures. Due to the small size of the investigated objects, manipulations and measurements are not trivial tasks. If mechanical or tribological characterization of single nanostructures is required, then mainly atomic force microscope (AFM) is used as a manipulation and measurements tool. AFM provides high resolution and accuracy, however it has certain limitations. Main problem is that manipulation and visualization cannot be performed simultaneously. Therefore there is no real-time visual feedback concerning the behavior of the structure during manipulation, which can lead to partial loss of essential data. In this work we demonstrate real-time manipulation technique inside a scanning electron microscope (SEM) employed for tribological and mechanical characterization of nanostructures. Certain advantages of the AFM are implemented with visual guidance of the SEM. Different approaches to force measurements are described through the examples on various nanowires and nanoparticles of different geometry [1-4]. Limitations of the method are discussed.

References

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