MODELING OF LIGHT INTERACTION WITH ROUGH NANO-OBJECTS

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Abstract

Light-matter interaction at nanoscale is source of information in many promising characterization techniques (e.g. Tip Enhanced and/or Surface Enhanced Raman Microscopy). Specific properties of light interaction with nanoscale objects is also used for development of novel devices, e.g. on the field of plasmonics. Theoretical treatment of all these devices is often based on assumption that materials forming surfaces are ideal (flat, non-contaminated, with optical properties known from databases).Realistic materials are however not ideal and we can observe many different surface irregularities. Most frequently it is surface roughness, originating from manufacturing process, like sputtering. In this contribution we present numerical approach for modeling performance of different devices and characterization techniques in presence of surface roughness. The approach is based on combination of material deposition modeling and fast Finite Difference in Time Domain solver of Maxwell equations based on use of graphics cards. Examples will be taken from the field of Tip Enhanced Raman Spectroscopy, Scanning Near Field Optical Microscopy and plasmonic nano-antennas.

Keywords: Surface roughness, plasmonics, TERS, FDTD

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