Effect of Nanoscale Roughness on Optical Trapping Properties of Surface Plasmon Polaritons Exerted on Nanoparticle

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Highlights:

- Based on the three-dimensional dispersive finite difference time domain method and Maxwell stress tensor equation, we establish a calculation model to investigate the effect of nanoscale surface roughness on the optical trapping properties of nanoparticle in a vicinity of the composite gold film with periodic circular holes.
- Surface roughness in the calculation model is simulated by utilizing the Monte-carlo method.
- Surface plasmon polaritons which are more effective to manipulate nanoparticle are excited by the interaction between the incident Gaussian beam and the periodic structure of gold film.
- The effects of root mean square height and correlation length of rough surface on surface plasmon polaritons and optical trapping force are analyzed in detail.