Optical forces exerted on nanowire dimers: New characterization of Plasmons

R.M. Abraham Ekeroth[1,2]
1- Instituto de Microelectrónica de Madrid, Isaac Newton 8 (PTM), Tres Cantos, Madrid, Spain
2- Instituto de Física Arroyo Seco- Universidad Nacional del Centro de la Provincia de Buenos Aires, Tandil, Buenos Aires, Argentina
martinabrahame@gmail.com

A new numerical study of the electromagnetic coupling between two metallic nanowires is realized under plane-wave incidence. Considered as near-field observables, the induced forces and torques can give a different point of view of the interaction [1-4].

Although several studies of the opto-mechanical inductions have been done [5-7], unexpected features of the movement are obtained. ``Coordinated'' spin for the wires are found, in addition to binding or repulsion forces between the wires and scattering forces. The rotations of the wires identify uniquely the surface plasmons. In particular, dark modes can be optically detected without using incidence with evanescent fields. The results could be applied to the real observation/ detection of surface plasmons [8].

Also, the validity of the Newton's third law in the system is discussed. The action-reaction law is directly valid for the mechanical response in small dimers. However, for bigger systems, the law needs to be recovered by considering the momentum carried by the scattered light [9].

References

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