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Surface plasmon resonance enhanced binding of metal nanoparticles K.L. CHAN, M.J. ZHENG, K.W. YU, The Chinese University of Hong Kong — The interparticle force between metallic nanoparticles illuminated by laser light has been studied theoretically. When the distances between the particles are sufficiently small, the excitation of surface plasmon modes within these particles can lead to strongly enhanced laser fields. As a result, there are strongly enhanced light-induced binding forces between these nanoparticles. For physically realizable laser power, these forces can exceed the van der Waals forces by several orders of magnitude. In our theoretical calculations, we considered the interparticle force and potential between two approaching metal nanoparticles. The metal particles are routinely modelled as Drude metallic spheres, and the interparticle force has been captured conveniently by an approximate multiple image formula between two spheres. When the incident light frequency is near the surface plasmon resonant frequency, we find that the force varies nonmonotonically with the distance and a stable local minimum in the potential energy can be found, signifying a binding between the particles. On the experimental and technological side, these studies are also crucial to optical spectroscopy in the nanoscales. Work supported by the General Research Fund of the Hong Kong SAR Government. [1] J. P. Huang, K. W. Yu, G. Q. Gu Electrorotation of a pair of spherical particles, Phys. Rev. E, Vol. 65, art. no. 021401 (2002).

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