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Optical forces at Morphology Dependent Resonance TSZ-FAI (JACK) NG, Hong Kong University of Science and Technology, ZHIFANG LIN, Fudan University, CHE-TING CHAN, Hong Kong University of Science and Technology — A strong optical force can be induced on a pair of transparent dielectric microspheres by exciting the morphology dependent resonance (MDR). We investigate such a resonant optical force through rigorous calculations using multiple scattering theory for the electromagnetic field and the Maxwell stress tensor for the electromagnetic force. The bonding and anti-bonding modes of the electric field of the MDR's correspond to strong attractions and repulsions respectively. At resonance, the force can be enhanced by orders of magnitude as compare to the off-resonance case. With a modest incident light intensity, it is showed that the MDR-force can be stronger than thermal fluctuations and the van der Waals forces when the separation between the spheres is more than a few tens of nano-meter, thus achieving the goal of manipulation. It is showed that stable binding of the spheres is possible. The dependence of the force on separation between the spheres, and the role of absorption by the material, and the robustness against sphere size dispersions are also discussed.

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