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Thermophoresis around dimer of gold spheres for enhancement of trapping range of plasmonic tweezers TETSUYA OGINO, KYOSUKE YASUDA, KEN YAMAMOTO, MASAHIRO MOTOSUKE, Tokyo University of Science — Trapping of nanomaterials by an optical radiation pressure can be effectively performed by combining an enhanced localized electric field on plasmonic structures due to surface plasmon resonance. Since an effective trapping area is limited in nanoscale, target transportation to the area from far would gain the trapping performance. This study investigates a potential of the nanomaterials transportation dispersed in the bulk liquid into the trapping area by thermophoresis. We performed numerical simulation of the electromagnetic field around a gold nanosphere dimer whose diameters are 20 - 300 nm and gap width is 1 - 50 nm as a plasmonic structure under irradiation of plane electromagnetic wave with the finite element method. Then the corresponding temperature field generated by photothermal hearing was obtained. 1 to 100 nm polystyrene spheres (PS) in water was considered. The trapping force, which includes optical gradient force, thermophoretic force, and drag force exerting on the PS, was calculated, and the range for the trapping was investigated. The results indicates that the overall trapping range strongly depends on the thermophoretic property, Soret coefficient. The possibility of wide-ranged nanomaterial trap by controlling the temperature field was confirmed.

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