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Optically controlled Marangoni Tweezers STEFFEN HARDT, SUBRAMANYAN NAMBOODIRI, SAJAN GEORGE, TOBIAS BAIER, Center of Smart Interfaces, TU Darmstadt, Petersenstraße 32, 64287 Darmstadt, Germany, MARTINA EWALD, MARKUS BIESALSKI, Department of Chemistry, TU Darmstadt, Petersenstraße 22, 64287 Darmstadt, Germany — A novel method for trapping and manipulating small particles is reported. The method relies on photoresponsive surfactants adsorbed to a gas-liquid interface that can be reversibly switched between two isomeric states using a focused laser beam. The principle is based on local changes of the surface tension, giving rise to Marangoni stresses. Depending on the type of surfactant isomer in the region around the laser spot, a flow either radially inward or outward is created. It is studied how the flow field generated depends on the light intensity and on the surfactant concentration. It is shown how the optically-induced inward flow can be utilized to trap and manipulate microspheres adsorbed to the gas-liquid interface. This principle of optically-controlled Marangoni tweezers opens new application perspectives, for example for the manipulation of nanoparticles. This is due to the fact that hydrodynamic stresses exhibit a more favorable scaling with the particle size than the Maxwell stresses utilized in conventional optical tweezers.

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