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Trapping and manipulating single nano-objects with dynamic temperature fields FRANK CICHOS, MARCO BRAUN, ANDREAS BREGULLA, University Leipzig, Germany, MOLECULAR NANOPHOTONICS GROUP TEAM — One of the challenges of single molecule experiments in solution is the ability to trap and manipulate one or even multiple molecules against the erratic Brownian motion. The Brownian fluctuations are fueled by thermal energy and increase in strength with increasing temperature. Therefore, it is at first glance counterintuitive to confine Brownian fluctuations with the help of elevated temperatures. In thermal nonequilibrium, however, temperature gradients induce thermo-phoretic and thermo-osmotic drifts, which provide the means for single particle manipulation in solution. Here we describe experiments which use optically heated metal nanostructures to create dynamical temperature profiles in solution. These temperature profiles induce thermo-phoretic drift fields that act as effective potentials for objects suspended in liquid. Combined with optical feedback mechanisms, such effective potentials can be shaped to store and manipulate single or even a well-defined number of multiple objects in a small observation volume. The developed thermophoretic trapping system therefore paves the way for extended single molecule studies in solution or even well controlled bi- or multi molecular interaction studies.

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