Title:	Controlling optical trapping of metal–dielectric hybrid nanoparticles under ultrafast pulsed excitation: a theoretical investigation†
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Abstract:	Crucial to effective optical trapping is the ability to precisely control the nature of force/potential to be attractive or repulsive. The nature of particles being trapped is as important as the role of laser parameters in determining the stability of the optical trap. In this context, hybrid particles comprising of both dielectric and metallic materials offer a wide range of new possibilities due to their tunable optical properties. On the other hand, femtosecond pulsed excitation is shown to provide additional advantages in tuning of trap stiffness through harnessing optical and thermal nonlinearity. Here we demonstrate that (metal/dielectric hybrid) core/shell type and hollow-core type nanoparticles experience more force than conventional core-type nanoparticles under both continuous-wave and, in particular, ultrafast pulsed excitation. Thus, for the first time, we show how tuning both materials properties as well as the nature of excitation can impart unprecedented control over nanoscale optical trapping and manipulation leading to a wide range of applications.
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