

# Light-induced heating of gold nanoparticle- microgel hybrids

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The ability of hybrid microgel systems to response to external stimuli is of great interest in basic research as well as for medical and technical applications. For photo-responsive systems, light-sensitive dyes or nanoparticles are combined with a responsive microgel matrix. Poly(N-isopropylacrylamide) (PNIPAM) - based microgels are sensitive to temperature, pH or ionic strength. The thermosensitive microgel exhibits a volume phase transition at around 32°C. We combine the PNIPAM microgel with spherical gold nanoparticles (Au NP) to create a photo-responsive hybrid material. The incorporation of the Au NP into the PNIPAM microgel influences the optical properties of the microgels via plasmon coupling during their volume phase transition [1] [2]. In order to study their effect as hot spots, we coupled a second laser for plasmon excitation into our dynamic light scattering (DLS) set-up. To improve the photothermal effect for our purpose, the loading density of Au NP within the microgels was varied and the size changes depending on loading, temperature and excitation laser intensity investigated. The plasmon excitation of Au NP by laser irradiation results in local heating providing enough heat to induce a reduction in the microgel size. The light-induced volume change can be controlled by varying the amount and spatial distribution of uptaken Au NP. The apparent internal temperature within the gel can be determined.

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