

Tuning Gold Nanoparticle Size via Re-Irradiation of Bromide-Induced Chains

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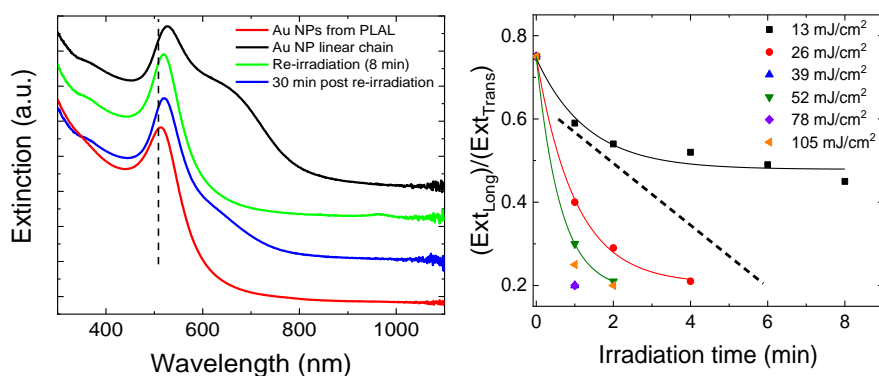
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Noble metal nanoparticles (NPs) exhibit unique size- and shape-dependent optical properties, making their controlled synthesis crucial for applications in sensing, photonics, and nanomedicine[1]. Pulsed Laser Ablation in Liquid (PLAL) and related techniques, such as Pulsed Laser Fragmentation (PLFL) and Pulsed Laser Melting (PLML), offer a chemical-free route to produce NPs with tunable size and shape[2].

Here, we investigate the laser-induced disruption of bromide-induced gold NP chains in aqueous solution via pulsed laser re-irradiation at varying fluences and wavelengths. Using UV-Vis absorption, Raman spectroscopy, and electron microscopy, we show that chain disruption and NP fragmentation can coexist depending on laser fluence. At low fluence (<20 mJ/cm²), chain disruption is slow and fragmentation is negligible, whereas higher fluences accelerate disruption and induce significant fragmentation. Kinetic analysis indicates an Arrhenius-type behavior. Moreover, irradiation at the transverse LSPR wavelength (532 nm) is markedly more efficient than off-resonance (1064 nm), suggesting a plasmon-driven mechanism. This study not only elucidates fundamental light-driven NP chain disruption mechanisms but also provides an alternative approach for tuning gold NP size.



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References:

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