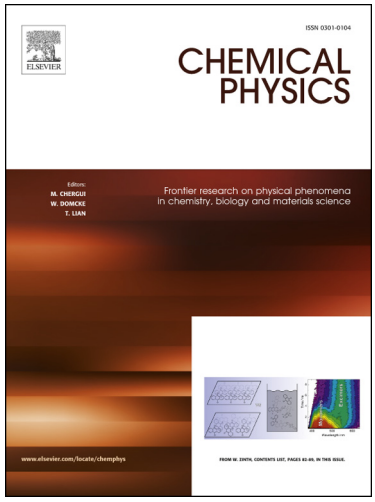

Fluorescence spectroscopy in probing spontaneous and induced aggregation amongst size-selective gold nanoclusters

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Fluorescence spectroscopy in probing spontaneous and induced aggregation amongst size-selective gold nanoclusters

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A B S T R A C T

Gold nanoparticles have been synthesized by borohydride reduction using poly(N-vinyl 2-pyrrolidone) as the stabilizing agent in aqueous medium in the size regime of 1 to 5 nm. Aggregation amongst these polymer-stabilized gold nanoparticles has been accomplished by the controlled addition of hydrazine or aggregation may occur spontaneously (devoid of any chemicals) that is ubiquitous to nanoparticulate systems. Now, fluorescencein isothiocyanate (FITC), a prototype molecular probe has been employed in understanding the physical principles of aggregation phenomenon of the size-selective gold nanoparticles undergoing spontaneous and induced-aggregation under stipulated conditions. It is seen that there is enhancement of fluorescence intensity of FITC in the presence of both spontaneously and induced-aggregated gold nanoclusters as compared to free FITC. Interestingly, it is observed that the fluorescence sensitivity is able to distinguish seven different sizes of the gold nanoparticles in the aggregates and maximum enhancement of intensity arises at higher concentration with increase in size of gold particles within the aggregates. With increase in concentration of gold nanoparticle aggregates, the intensity increases, initially, reaches a maximum at a threshold concentration and then, gradually decreases in the presence of both spontaneously and induced-aggregated gold particles. However, the salient feature of physical significance is that the maximum enhancement of intensity with time has remained almost same for induced-aggregated gold while decreases exponentially with spontaneously aggregated gold particles.