

# Clustering of Gold Nanoparticles in Soft Confined Environments Using pH responsive Double Hydrophilic Block Copolymers

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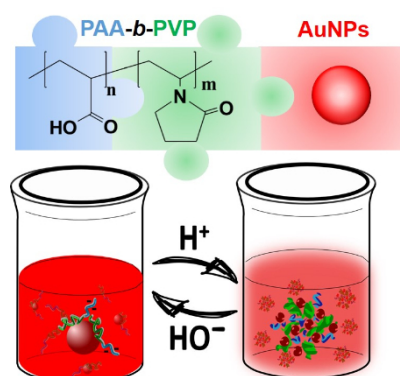
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The controlled organization of inorganic species in soft, confined environments is fundamental to processes such as crystallization, catalysis, and bioimaging [1,2]. Double hydrophilic block copolymers (DHBCs) provide a powerful and modular platform for directing such assemblies in water, thanks to their selective interactions with nanoparticles. Here, we unravel the assembly pathways of the poly(acrylic acid)- *block* -poly(N-vinyl-2-pyrrolidone) (PAA-*b*-PVP) DHBC in the presence of gold nanoparticles (AuNPs), and we identify the molecular mechanisms governing the formation of the resulting architectures [3]. AuNPs interact selectively with the non-ionizable PVP block, and their assembly is activated by pH-controlled modulation of PAA solubility. This stimulus-responsive strategy enables the rapid and reversible formation of three-dimensional hybrid supracolloids (hSCs) in water. The resulting structures consist of a highly swollen, disordered hydrogel-like polymer matrix in which AuNPs are uniformly distributed.

A multimodal characterization approach (SAXS, QCM-D, STEM-EDX, FEG-SEM) reveals that hSC formation emerges from the synergistic interplay between reduced PAA solubility and the establishment of inter- and intra- chain hydrogen bonding. Altogether, these findings provide fundamental insight into DHBC– nanoparticle interactions and establish PAA-*b*-PVP assemblies as versatile, tunable platforms for engineering hybrid nanomaterials in solution, with promising implications for multicomponent functional architectures.

## Keywords:

hybrid supracolloids, pH responsiveness, double hydrophilic block copolymers, gold nanoparticles clustering



*Schematic representation of the formulation of the hybrid supracolloids between preformed gold nanoparticles and PAA-*b*-PVP block copolymer, in acidic and basic conditions.*

## References:

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