Morphological Diversity, Protein Adsorption, and Cellular Uptake of Polydopamine-Coated Gold Nanoparticles

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Polydopamine (PDA)-coated nanoparticles (NPs) are adhesive bionanomaterials widely utilized in intracellular applications, yet how their adhesiveness affects their colloidal stability and their interactions with serum proteins and cells remain unclear. We systematically investigate the effects of dopamine (DA) concentration and polymerization time (both reaction parameters spanning two orders of magnitude) on the morphological diversity of PDA-coated nanoparticles by coating PDA onto gold nanoparticle cores. Independent of the DA concentration, Au@PDA NPs remain largely aggregated upon several hours of limited polymerization; interestingly, extended polymerization for 2 days or longer yield randomly aggregated NPs, nearly monodisperse NPs, or worm-like NP chains in the ascending order of DA concentration. Upon exposure to serum proteins, the specific type of proteins adsorbed to the Au@PDA NPs strongly depends upon the DA concentration. As DA concentration increases, less albumin and more hemoglobin subunits adhere. Cellular uptake is a strong function of polymerization time. Serum-stabilized Au@PDA NPs prepared by limited polymerization enter cancer cells more abundantly than those prepared by extended polymerization. Our data show the importance of DA concentration and polymerization time for tuning the morphology and intracellular delivery of PDA-coated NPs.[1]

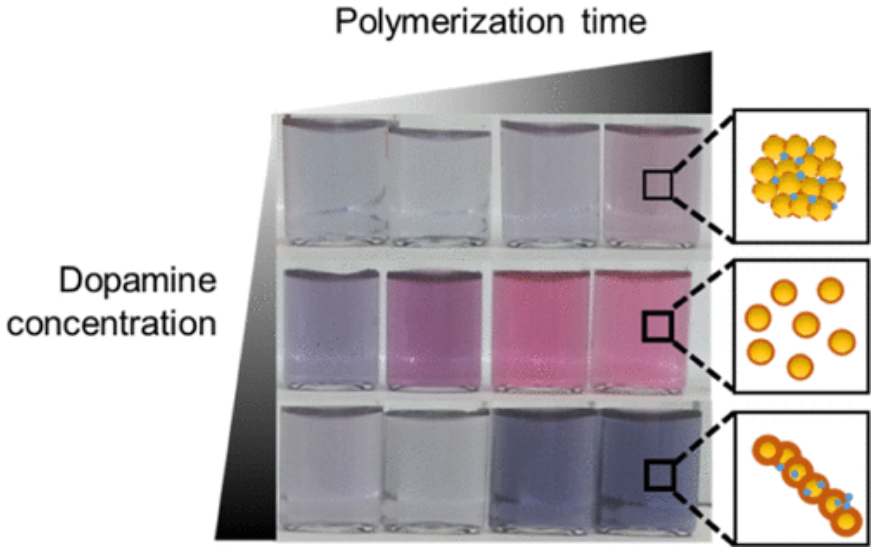

Figure 1: Morphological diversity of polydopamine-coated gold nanoparticles as a function of polymerization time and dopamine concentration.

References

[1] Sy, K.H.S.; Ho, L.W.C., Lau, W.C.Y.; Ko, H.; Choi, C.H.J. *Langmuir* **2018**, *34*, 14033-14045.