Microfluidics assisted fabrication of polymer protein core-shell nanoparticles via co-assembly

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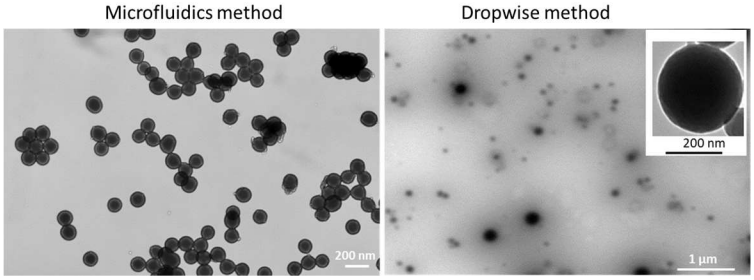
Polymer/enzyme hybrids have served as a useful strategy for enzyme engineering. In our previous study, poly(4-vinylpyridine) (P4VP) and arylamine N-oxygenase CmlI core-shell nanoparticles (P4VP-CmlI) were generated through a co-assembly process and demonstrated significantly enhanced activity by comparing with free CmlI enzyme due to a more efficient electron transferring process. P4VP-CmlI could serve as a novel bio-catalytic platform for nitro- and nitrosoaromatic synthetic application. However, the current method of batch-mode mixing faces significant challenges in mixing control to generate uniform nanoparticles, and to minimize batch to batch variation which may affect its future application.

In current study, we investigate the fabrication of polymer protein core-shell nanoparticles through an AC electrokinetic fast-mixing method in a non-parallel microchannel. In this method, electrokinetics flow was utilized to control and enhance fluid mixing in a quasi T-shaped microchannel with electrically conductive sidewalls. During the preliminary tests, with this microfluidics based fabrication method, P4VP-CmlI core-shell nanoparticles could be successfully synthesized. By comparing with the nanoparticles prepared by conventional dropwise method, nanoparticle homogeneity has been significantly improved.



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