Group of Clinical and Biomedical Macromolecules

Generation of nano-sized core–shell particles using a coaxial tri-capillary electrospray-template removal method

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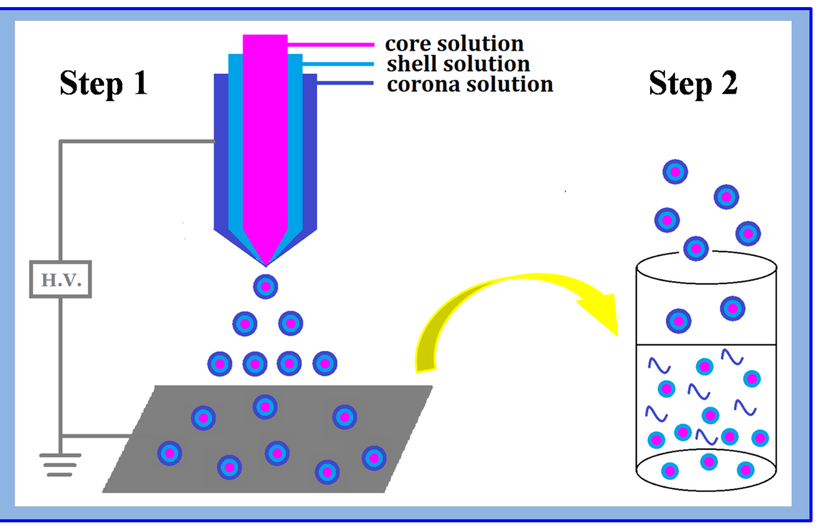
Introduction

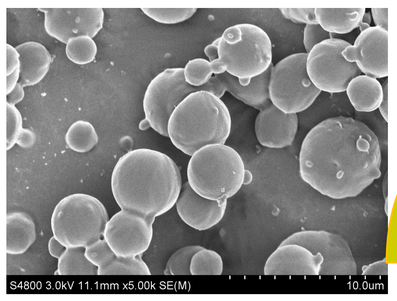
Electrospray method has been used to fabricate encapsulation particles because of it's several unique advantages. But the size of electrosprayed particles was always within micron to submicron range. Nanoparticles have shown more advantages than microparticles to drug delivery system. Coaxial tri-capillary electrospray-template removal process was proposed to control the size of electrosprayed particles.

Method

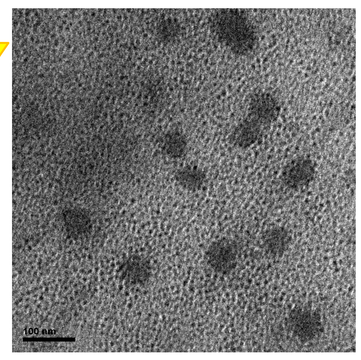
Step 1: coaxial tri-capillary electrospray, Step 2: template removal

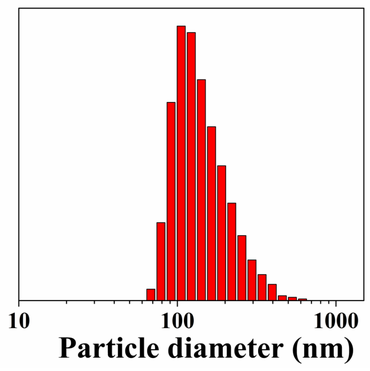


Preparation of nanoparticles



➢ **Step 2: Electroaprayed microparticles were treated by water to remove the PEG corona template. (decrease the size)**



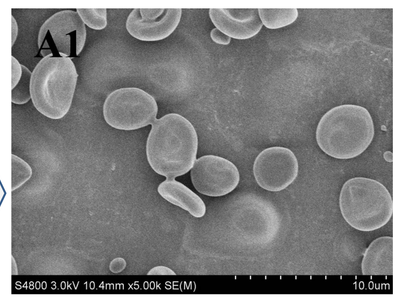


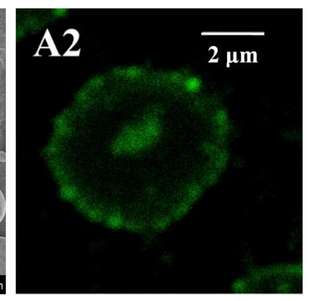
➢ **Step 1: PEG, PLA-PEG, PEG were used as core, shell and corona materials, respectively.**

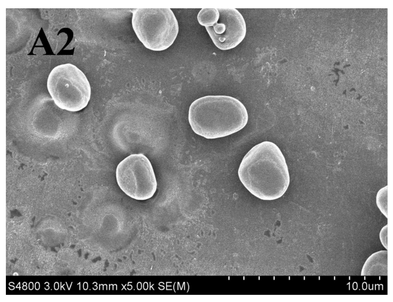
Size control

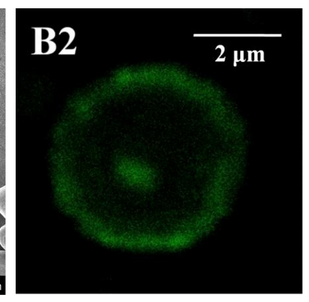
Effect of corona flow rate (A1~ A3: 0.1, 0.2, 0.5 ml/h) on particle morphology and corona thickness

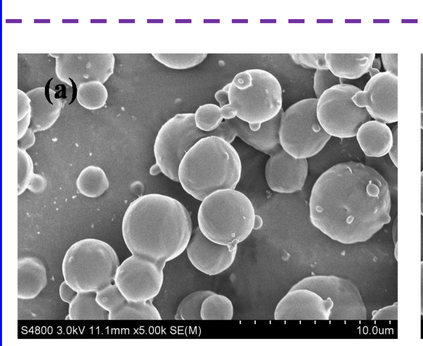
Effect of corona flow rate (a~ c: 1.0, 0.8, 0.5 ml/h) on particle size before and after water treatment

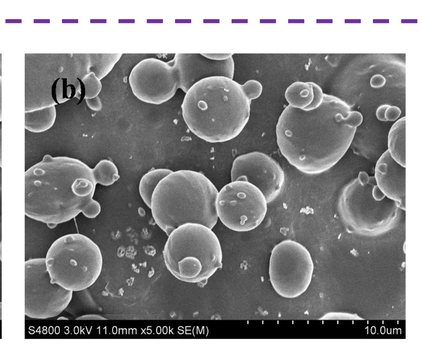


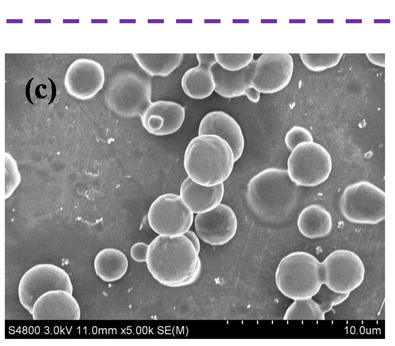


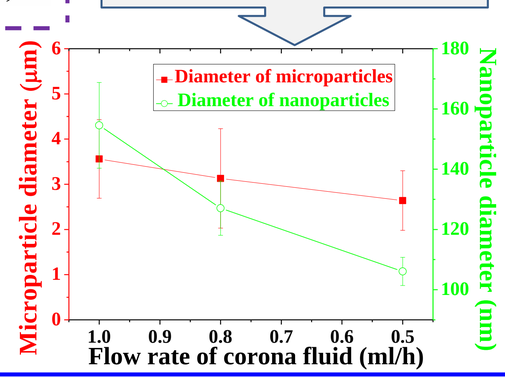


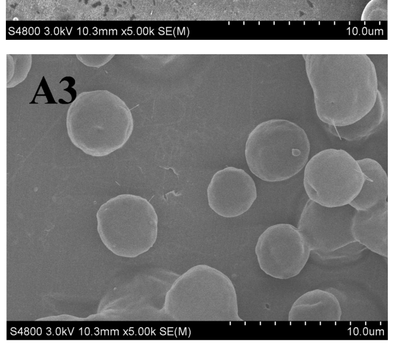


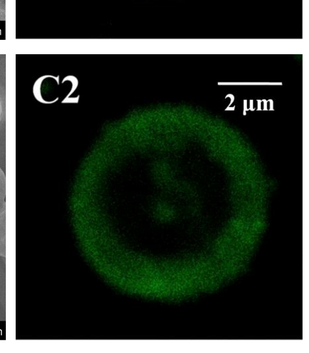






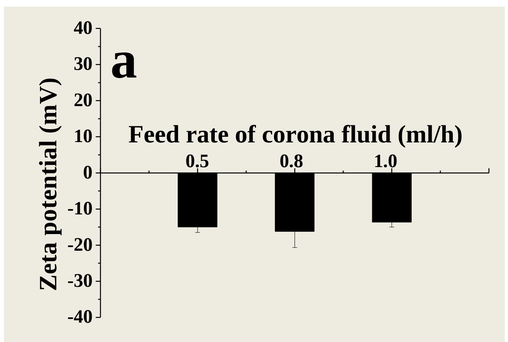


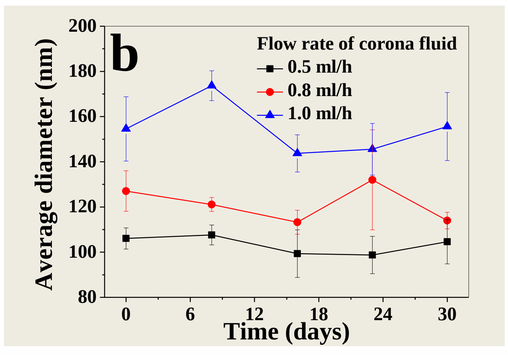


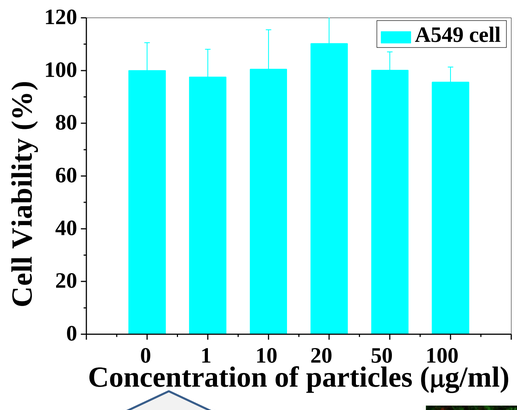


Nanoparticle properties

Dispersion stability



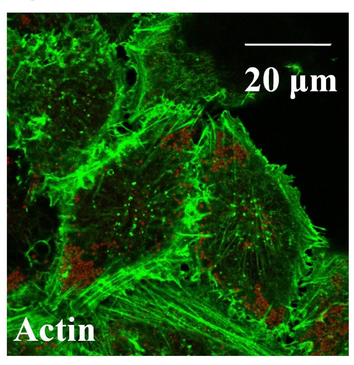


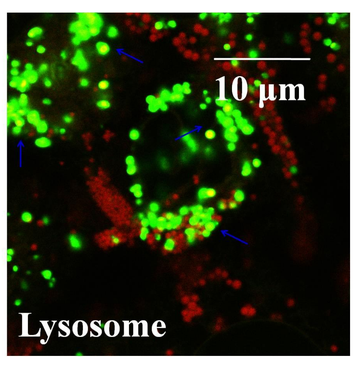


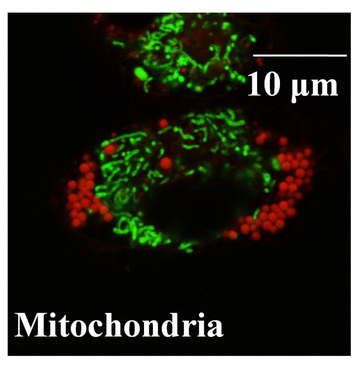
Cytotoxicity

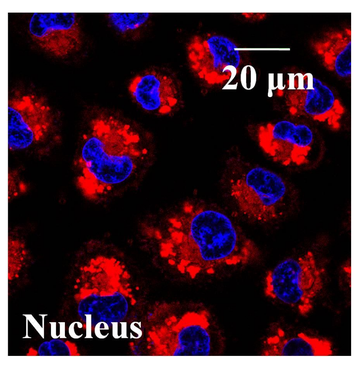
Cellular uptake

Nanoparticles were labeled with Nile Red



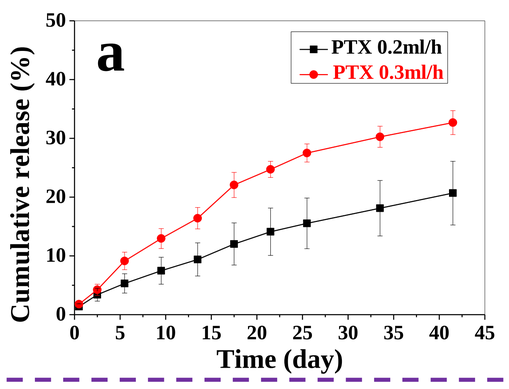


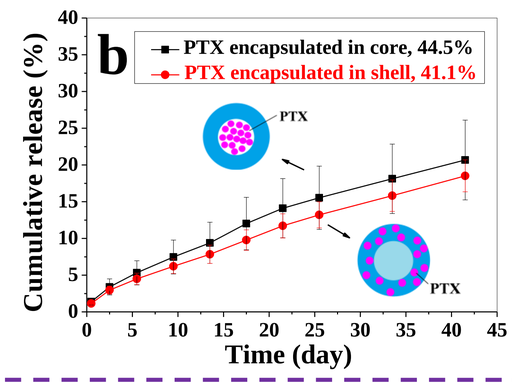




Drug release

Effect of drug loading content and drug location on release behaviors





Conclusion

- **Nanoparticles with about 100 nm diameter were fabricated and the size could be controlled.**
- **PLA-PEG nanoparticles showed potential properties as drug delivery system.**

Reference

- **I. Loscertales, A. Barrero, I. Guerrero, et al. *Science*, 2002, 295 (5560): 1695-1698**
- **L. Cao, J. Luo, K. Tu, L. Wang, H. Jiang. *Colloids and Surfaces B: Biointerfaces*, 2014 (115): 212-218.**