

One-step Production of Polyelectrolyte and Charges Nanoparticles

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ABSTRACT:

Producing smaller and smaller neutral nanoparticles becomes a trend which main motivation is to diversify their application fields, such as drug delivery, biosensing or environmental research. However, charged and biphasic polymeric nanoparticles (NPs) did not yet find such success mainly due to the multi-step and time-consuming conventional production route.[1]

We propose here, for the first time, to extend the emulsification-evaporation method to the one-step production of negatively charged and Janus polymeric NPs. In this purpose, we used various processes (rotor-stator mixing, sonication and elongational-flow micromixing) to investigate the possible formation of poly(styrene sulfonate), PSS, NPs or NPs with a hydrophobic domain (poly(lactic-co-glycolic acid), PLGA) and a hydrophilic charged domain of PSS. We were thus able to control the particles' sizes, ranging from 30 to 400 nm, and we found that only the elongational-flow micromixer allowed the production of Janus-like NPs (Figure 1). Moreover, playing on PSS/PLGA mass ratio allowed to control the particles' shape, from Janus to core-shell structure.[2]

As a conclusion, we highlighted very interesting results concerning the controlled one-step production of monomodal charged particles which size can be tuned only by varying process parameters and with shape that can be tuned by varying chemical parameters.

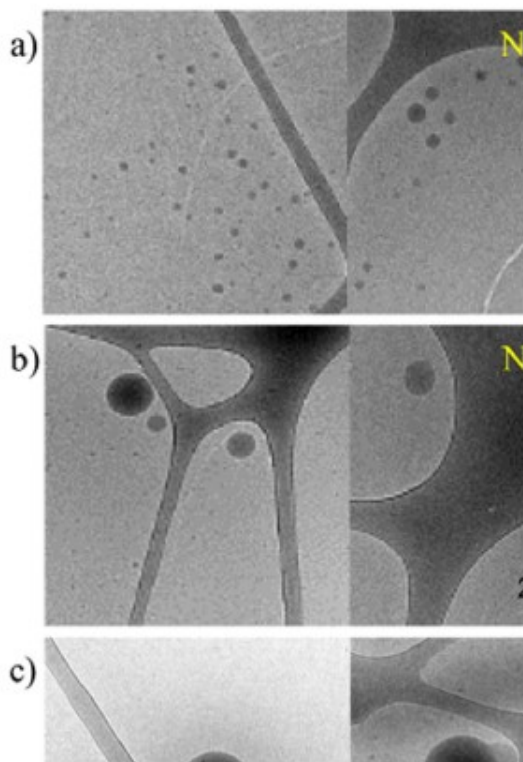


Figure 1: Cryo-TEM images of PSS/PLGA nanosuspensions obtained with a) ultrasonicator, b) rotor-stator mixer and c) elongational-flow micromixer.[2]

KEY WORDS: Charged nanoparticles, polymeric Janus nanoparticles, emulsification, interfacial chemistry, chemical engineering

References

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