How molecular internal-geometric parameters affect PB-PEO polymersome size in aqueous solution - DTU Orbit (08/11/2017)

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Amphiphilic polybutadiene polyethylene oxide (PB-PEO) is one of the best known chemistries to form stable vesicular morphologies, stated as polymersomes, in aqueous environment. Mimicking cell membranes, these structures self-assemble in an “amphiphilic window” determined by $0.15<f<0.35$ where f is the ratio between the hydrophilic block volume and the entire diblock volume. However the polymersome size distribution also depends on molecular weight (Mn) and in order to gain insight on how f and Mn together determine polymersome size, we prepared PB-PEO diblock copolymers with different block lengths and analyzed vesicle morphology via Dynamic light scattering (DLS) and Freeze-fracture transmission electron microscopy (FF-TEM). We found three main regimes: high f / low Mn with polymersomes of mixed diameter, high f / high Mn with mainly large polymersomes and low f, with mainly small polymersomes. In the first region, the polymersomes are highly polydisperse. There is a tendency towards increased diameter with increasing f and Mn. Taken together our findings can help to identify how polymersome self-assembly can be controlled to achieve size distribution specificity alleviating the need for subsequent tuning of size via extrusion. This can pave the way for cost-effective upscaling of polymersome production for biomedical and biomimetic applications. ©

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