In Vivo Optical Imaging Enabled by Soft-Matter Analogues of the Quantum Dots

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Abstract: We demonstrate that in aqueous solution, hydrophobic conjugated-multi(porphyrin)-based near-infrared fluorophores (NIRFs) cooperatively self assemble with amphiphilic diblock copolymers to form polymersomes (100 nm – 20 μm diameter polymer vesicles). The thick membranes of these synthetic vesicles uniquely segregate and uniformly disperse large numbers of high emission dipole strength NIRFs. Extrusion methods enable isolation of homogeneous NIR-emissive polymersomes having a 100 nm uniform diameter. Long-wavelength optical excitation of such assemblies generates intense, highly localized emissive signals capable of penetrating through the dense tumor tissue of a live animal. Robust, NIR-emissive polymersomes thus define a *soft matter* platform with exceptional potential to facilitate deep-tissue fluorescence-based imaging for *in vivo* diagnostic and drug-delivery applications.