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Morphological investigation on PTX-loaded poly(2-oxazoline) molecular brushes

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Poly(2-alkyl-2-oxazoline)s (POx) are well known for their tunable thermoresponsive properties and good biocompatibility, which make them promising materials for biomedical applications, e.g. as drug carriers. Depending on the type of alkyl substituent, they can be hydrophilic, e.g. poly(2-methyl-2-oxazoline) (PMeOx), thermoresponsive, e.g. poly(2-ethyl-2-oxazoline) (PEtOx) and poly(2-propyl-2-oxazoline) (PPrOx), or hydrophobic, e.g. poly(2-butyl-2-oxazoline) (PBuOx). In the present work, molecular brushes, featuring PMeOx-b-PBuOx block copolymer side arms densely-grafted on a poly(methacrylic acid) backbone, are investigated in aqueous solution. As the PBuOx block is attached to the backbone, the PMeOx block is located near the periphery of the molecular brush. In this architecture, the PBuOx core may store the hydrophobic anticancer drug, Paclitaxel (PTX), whereas the PMeOx shell may facilitate transportation in human body. With small-angle neutron scattering, the morphology of the aqueous solutions of PTX-loaded molecular brushes was investigated for various degrees of polymerization of the backbone and the side arms, disclosing the effect of the molecular architecture on the drug-loading ability, providing hints on the optimum design of the drug delivery molecules.

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