Highly Positively Charged Amine Functionalized Core-Shell Microgels

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Microgels containing cationic moieties are widely used for drug delivery systems [1] and furthermore they can assemble to colloidal crystal structures [2]. Positive charges inside of a thermo-sensitive poly(N-isopropylacrylamide) (pNIPAm) microgel network change the physicochemical properties such as the volume phase transition, surface interactions and degree of swelling in a significant way. To track their behaviour by optical confocal microscopy, microgels can be marked by introducing a fluorescent solid core without significantly influencing the performance of the microgel [3]. While there are many examples of negatively charged microgels, which assemble via Coulomb interactions, highly positively charged microgels that can perform accordingly remain unavailable. Primary amines attain positive charge below their isoelectric point; however, such monomers lack sufficient incorporation rates for introduction into the microgel network [4]. To overcome this drawback, we introduce BOC-protected *N*-(3-aminopropyl)methacrylamide into the microgels shell of our composite particles. Deprotection after synthesis yields positive microgels with primary amines. We apply up to 15 wt% of the protected amine during the synthesis, yielding 4 mol% of incorporated amines. These microgels can interact with negatively charged microgels to form colloidal molecules and the primary amines enables post modification techniques for the introduction of biomedical recognition motifs (glycans and peptides) for example as scavenger units for toxins.

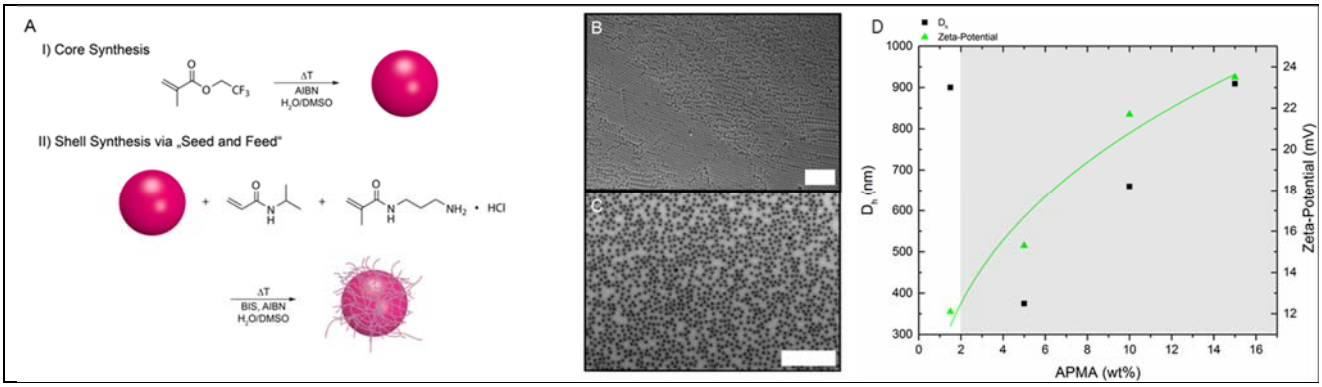

Figure 1. a) Synthesis of core and core shell microgels. Electron microscopy images of b) the prepared core and c) core-shell microgels. d) Zeta potential and hydrodynamic radius of the deprotected core-shell microgels in relation to the N-(3-aminopropyl)methacrylamide content. Scale bars represent 2 µm.

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Acknowledgement: The authors acknowledge support via the Deutsche Forschungsgemeinschaft DFG through the collaborative research center SFB 985 “Functional microgels and microgel systems” (project C3).