Investigation of the properties of multi-responsive core-shell microgels

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In recent years multi-responsive core-shell microgels have received increasing attention due their potential for applications as sensors [1] or drug delivery systems [2]. In this work, we present the synthesis and the characterization of new temperature and pH-sensitive core-shell microgels having a polystyrene-core and a poly-N-isopropylacrylamide (NIPAM)-copolymer-shell. For the copolymerisation we used different carboxylic acids like acrylic acid (AAc), butenoic acid (BuAc) or pentanoic acid (PeAc).

The characterization of the microgels was done in the swollen and in the collapsed state. For the investigation of the particles in the totally collapsed state different imaging techniques like scanning electron microscopy (SEM) and transmission electron microscopy (TEM) were used (fig. 1). Moreover, the sizes of the particles in the swollen state were analyzed by photon correlation spectroscopy (PCS) (fig. 2, left). In addition, we used temperature dependent PCS measurements to study the deswelling and phase transition behaviour (fig. 2, right). The volume phase transition temperature (VPTT) of a pure polystyrene-poly(NIPAM) core-shell microgel is around 30°C. By using a carboxylic acid as comonomer the VPTT can be shifted to higher temperatures. The VPTT of our synthesized microgels lies between 32°C and 35°C depending on the amount and kind of carboxylic acid.
