

## Core-Shell Microgels in Suspension: Swelling Behaviour Observed by FTIR Spectroscopy

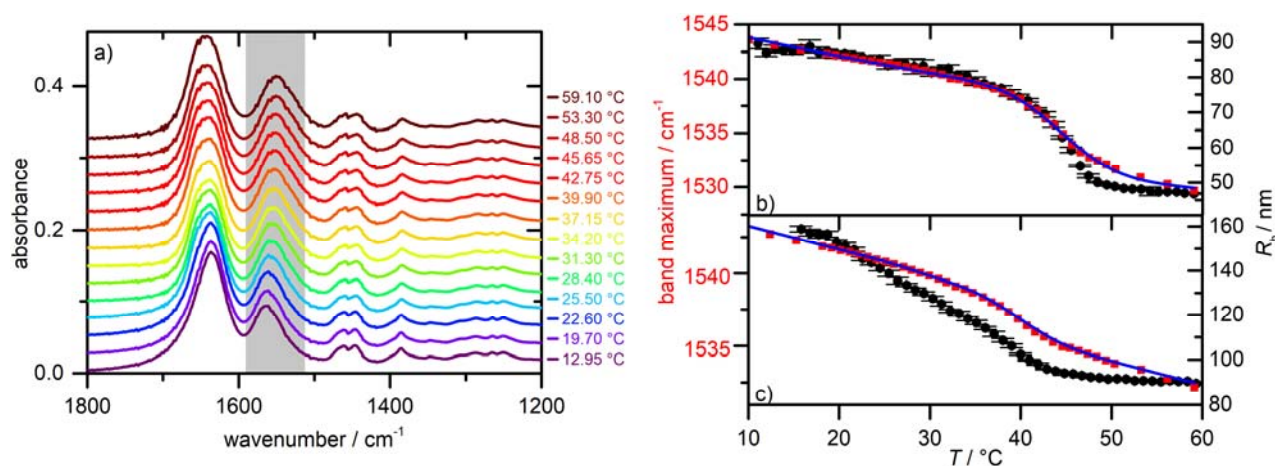
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Stimuli-responsive microgels are promising candidates for applications like drug delivery, matrixes for catalysts, nanoactuators and smart surface coatings. To tailor the response, the architecture is of vital importance: While statistical copolymer microgels based on *N*-isopropylmethacrylamide (NiPMAM) and *N*-*n*-propylacrylamide (NnPAM) show a cooperative phase transition at a certain temperature [1], a linear response of the hydrodynamic radius measured by photon correlation spectroscopy (PCS) is observed for core-shell microgel particles (Fig. 1, c) [2].

FTIR spectroscopy is a sensitive method to investigate the molecular hydration in the microgel network [3]. In this work we investigate the swelling behavior of various microgels in H<sub>2</sub>O by temperature dependent measurement of the NH-vibration. The phase transition determined by FTIR spectroscopy in homopolymer and statistical copolymer microgels based on NiPMAM and NnPAM is in accordance with results from PCS. However, measurements of core-shell particles show a broadening and shift of the respective phase transition temperatures indicating an interaction of core and shell polymers on a molecular level.

In conclusion, FTIR spectroscopy is a convenient approach to investigate the whole particle, with a special focus on the internal structure, whereas PCS is limited to the diffusion properties dominated by the particle shell.



**Figure 1.** a) Set of temperature dependent FTIR-Spectra of an aqueous microgel suspension. b) Temperature dependent wavenumber of the NH-band (squares) in comparison to results from PCS (circles) for a NiPMAM-microgel. c) Results from a NiPMAM-core-NnPAM-shell microgel reveal that the phase transition of the whole particle is dominated by NiPMAM.

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[2] M. Zeiser, I. Freudensprung, T. Hellweg, *Polymer*, **2012**, 53, 6096-6101

[3] M. Keerl, V. Smirnovas, R. Winter, and W. Richtering, *Macromolecules*, **2008**, 41, 6830-6836