Supporting Information for: Nanocomposite coatings with stimuli-responsive catalytic activity

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1 SEM studies of Pd nanoparticles synthesized in different binary brushes

Using short P2VP chains, a high grafting density of the temperature-sensitive component PNIPAAm and a high coverage of the surface with catalytically active nanoparticles can be ensured at the same time. Figure 1 displays SEM images of Pd nanoparticles synthesized in binary PNIPAAm-P2VP brushes with P2VP of two different molecular weights. No major influence of the polymer length on the nanoparticle size and distribution is detected. A Neon 40EsB microscope (Carl Zeiss Microscopy GmbH, Jena, Germany) was used for these measurements.

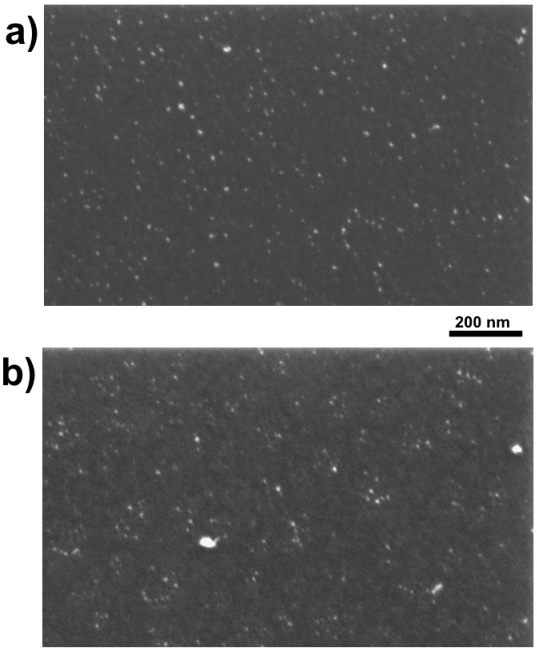

Fig. 1 SEM images (InLens detector) of Pd nanoparticles synthesized in binary PNIPAAm-P2VP brushes with P2VP of $M_n = 40\,600\,g/mol$ (a) and $M_n = 10\,000\,g/mol$ (b)

2 Characterization of swollen brushes by insitu-AFM

To verify the optical modeling of swollen brushes with nanoparticles, insitu-AFM studies were conducted. To evaluate the thickness of the swollen brush with and without nanoparticles, the polymer layer was scratched by a razor blade in dry state and thoroughly rinsed with ethanol. AFM measurements were done

insitu in a droplet of water on the sample. A first order flattening, followed by a first order plane fit of the upper level of the step was applied to the height images, using NanoScope Analysis Software, Version 1.40 (Bruker Corporation, Karlsruhe, Germany). The steps were measured as 30 nm without nanoparticles and 22 nm with Pd nanoparticles.

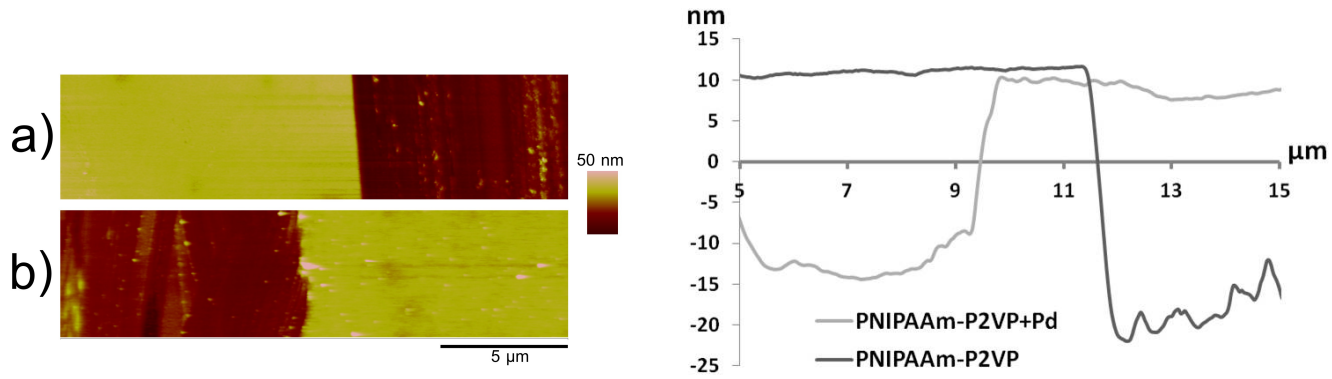

Fig. 2 AFM height image and the corresponding horizontal sections of razor cut PNIPAAm-P2VP brushes (a) without nanoparticles, (b) with Pd nanoparticles, swollen in water

3 Characterization of structural changes by GISAXS and AFM

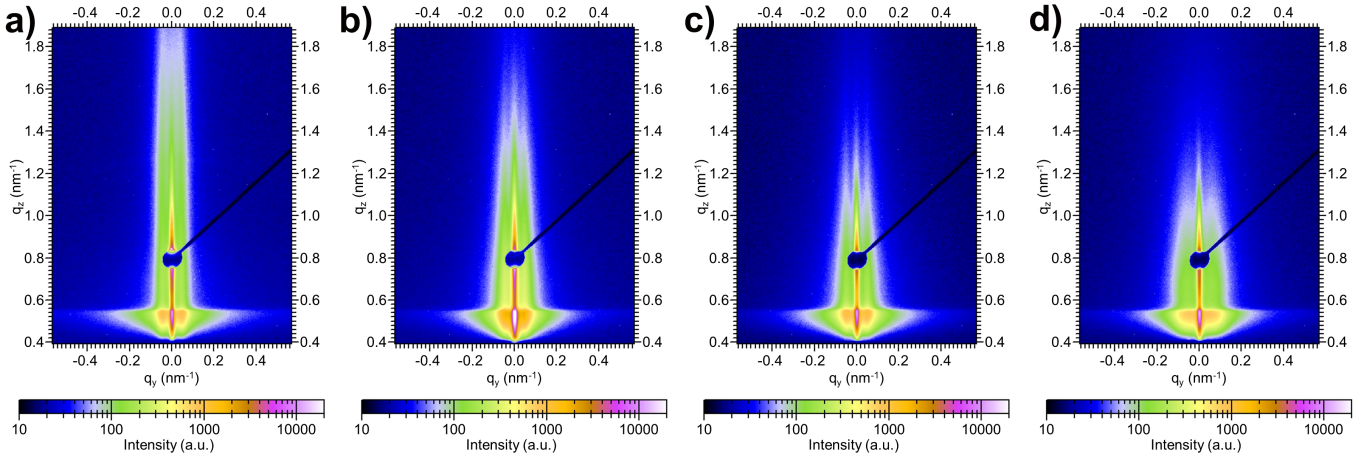

Fig. 3 2D GISAXS data for PNIPAAm-P2VP brushes with Pd nanoparticles after different temperature and pH conditions. (a)20° C, pH 7, (b)20° C, pH 3, (c)40° C, pH 7 and (d)40° C, pH 3; the specular peak is blocked by a point-shaped beamstop

For AFM characterization of the structural changes in PNIPAAm-P2VP brushes with and without nanoparticles, samples were prepared in the same way as for GISAXS measurements. Measurements were done in dry state under ambient conditions.

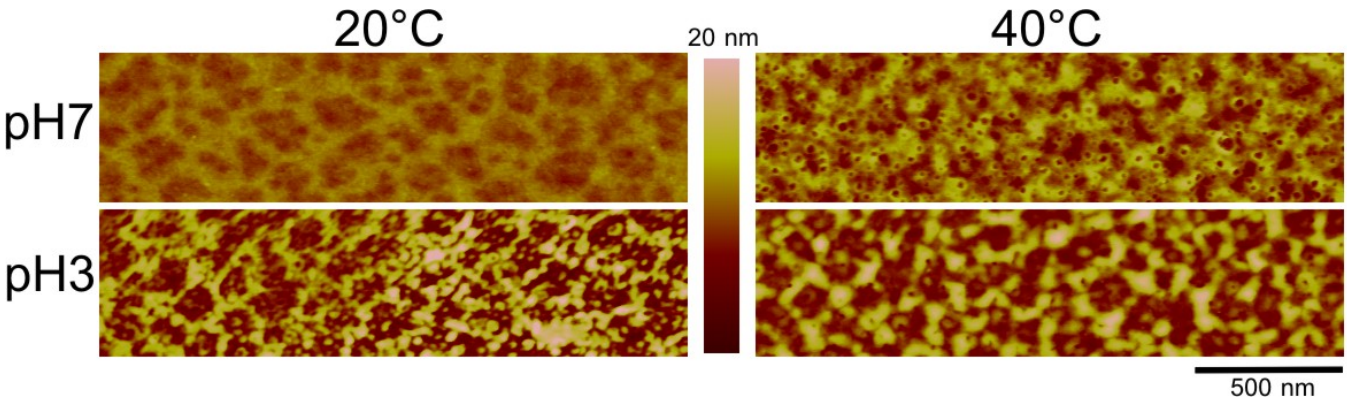

Fig. 4 AFM height image of PNIPAAm-P2VP brushes without nanoparticles after different temperature and pH conditions

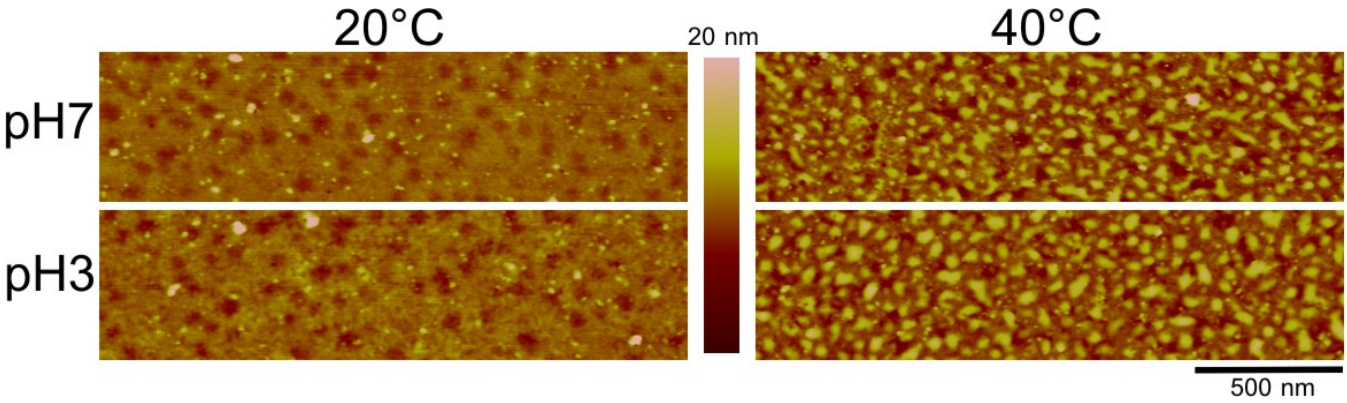

Fig. 5 AFM height image of PNIPAAm-P2VP brushes with Pd nanoparticles after different temperature and pH conditions