Due to their mild reaction conditions and their high chemo-, stereo- and regioselectivity, the usage of enzymes as biocatalysts is of high research interest. For the application in industrial processes it is necessary that the used enzymes are stable at high temperatures, at different pH values and in the presence of organic solvents. This stability can be achieved by embedding these enzymes into a polymer matrix. Due to their reversible shrinking above the lower critical solution temperature (LCST) of around 32°C microgel particles made of poly-N-isopropylacrylamide (p-NIPAM) are suitable as polymer matrix.

In this study, different sized p-NIPAM particles were synthesized via surfactant free emulsion polymerisation\cite{1,2}. The characterization of the size of the p-NIPAM particles was done by Dynamic Light Scattering (DLS). To get some information about the meshsize and the structure of the synthesized p-NIPAM hydrogel particles, citrate stabilized spherical Gold Nanoparticles (NPs) with different diameters were incorporated within the polymer network. By evaluation of the samples with transmission electron microscopy (TEM), the location of the Gold NPs in the p-NIPAM network and resultant structural information can be achieved. The determined meshsize gives the maximal size of the enzyme which fits into the polymer meshes and can be immobilized within the p-NIPAM particles. Afterwards, different enzymes (lipase B, peroxidase) were immobilized within the polymer network using a solvent exchange from polar to organic solvents\cite{3}. To determine the position of the enzymes in the polymer network the enzymes were labeled with Fluorescein-5-isothiocyanat (FITC). The immobilized samples were investigated by confocal laser scanning microscopy (CLSM).

The determined activity of the immobilized enzymes shows an increase after immobilization within the p-NIPAM hydrogel particles.