



## Incorporation of thermo and pH-sensitive microgel onto nitrogen plasma activated cotton surface



**Post Doc** : Audrey Tourrette  
**Supervisors** : M.M.C.G. Warmoeskerken  
 : D. Jovic  
**Research group**: CTW / EFSM  
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**Phone** : +31.53.489 2899  
**Fax** : +31.53.489 3849  
**E-mail** : [A.Tourrette@utwente.nl](mailto:A.Tourrette@utwente.nl)  
**URL** : <http://www.ctw.utwente.nl/efsm/>  
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### Introduction:

The topics of Marie Curie Excellence Grant project ADVANBIOTEX are textile materials with new **advanced functionalities** and **environmental responsiveness**. The project explores the potential to modify the surface of textile fibres by coating existing textile materials (mostly cellulose based) with a thin layer of **thermo and pH-sensitive** microgel based on **biocompatible polymers**.

### Scope of the project:

The focus of the project is on preparation of poly(N-isopropylacrylamide)/chitosan microgel (PN/CS) and integrating it onto nitrogen plasma activated cotton fabric with sufficient durability, while still retaining the effectiveness of the surface modifying system.

### Results:

#### (1) PN/CS microgel responsiveness

Chitosan is a typical pH-sensitive polymer which responds to changes in the pH of the surrounding medium by protonation /deprotonation that imparts charges on its amino groups. The pH-induced phase transition results in varying dimensions (swelling and deswelling) of the hydrogel (Fig.1).

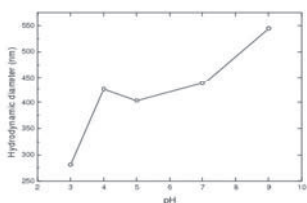


Fig.1: Hydrodynamic diameter of PN/CS microparticles in aqueous suspension ( $1.1 \cdot 10^{-1}$  g/L) at 25°C as a function of pH.

Poly(N-isopropylacrylamide) is synthetic polymer, which creates thermosensitive gel when

crosslinked. When heated above 34 °C the gel shrinks (Fig.2).

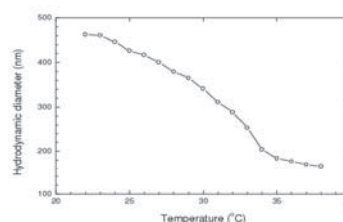


Fig.1: Hydrodynamic diameter of PN/CS microgel in aqueous suspension ( $2.3 \cdot 10^{-1}$  g/L, NaCl 1 mM, pH 7.3) as a function of temperature.

#### (2) Incorporation of PN/CS microgel to plasma activated textile material

Plasma treatment produces chemically active species such as radicals, free electrons and ions, which generate free radicals on the cotton fabric surface. After plasma treatment, activated cotton was immersed into a microgel suspension. PN/CS particles are clearly visible at the cotton surface (Fig.3). This result shows that this method is an efficient and environmentally acceptable pretreatment for biopolymer cotton surface incorporation.

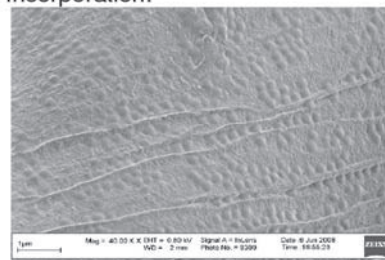


Fig.3: SEM image of nitrogen plasma treated cotton surface with incorporated PN/CS microgel.

### Acknowledgement

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