POLY(N-ISOPROPYLACRYLAMIDE) COATED POLYANILINE COLLOIDS PREPARED BY ENZYMATIC POLYMERIZATION: MORPHOLOGY AND pH- AND TEMPERATURE SENSITIVE OPTICAL PROPERTIES

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ABSTRACT

Polyaniline (PANI) colloids have attracted great attention due to their water processability, controlled morphology, electrical conductivity, and facile synthesis. Many water soluble polymers have been studied as steric stabilizers[1] and the role of several parameters such as oxidation temperature, stabilizer concentration, and doping agent have been studied. However, aniline chemical oxidation is carried out in very acidic reaction media, with typical pH close to 1.0 or even lower. Enzymatic polymerization is an alternative polymerization pathway that is carried out in milder conditions than chemical polymerization. We previously reported the enzymatic synthesis of "smart" polyaniline colloids using poly(N-isopropylacrylamide) (PNIPAM) as steric stabilizer[2]. These colloids are synthesized in water forming PANI dispersions with good colloidal stability, and optical properties that depend strongly on both the pH and temperature. In Figure 1 we show different polyaniline particles stabilized with poly(N-isopropylacrylamide) as steric stabilizer. The effect of oxidation rate is evident by comparing Figure 1a and 1b, while comparing with 1c shows the importance of using an adequate counterion during synthesis. In this work, we show the influence of several synthesis parameters on the morphology, colloidal stability and the resulting optical properties of the PNIPAM coated PANI colloids and their aqueous dispersions.

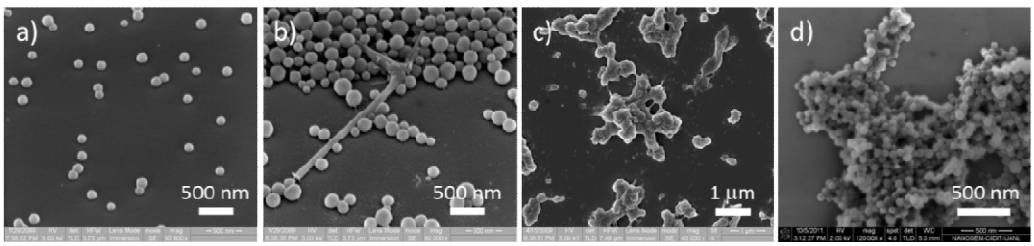

Fig. 1: Synthesis of PNIPAM coated PANI colloids under different conditions. a) slow oxidation rate, b) fast oxidation rate, c) slow oxidation rate using methanesulfonic acid as aniline counterion. d) slow oxidation rate without PNIPAM as steric stabilizer.

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References

[1]Stejskal, J; Kratochvíl, P; Helmstedt, M. *Langmuir* **1996** 12, 3389.
[2]Cruz-Silva, R.; Arizmendi, L; Del-Angel, M; Romero-Garcia, J. *Langmuir*. **2007**, *23:8*.