

Chemistry Department FCT-UNL

Super-hydrophobic textiles

REQUIMTE/Bionano@REQUIMTE



INÊS OSÓRIO

(PhD Student)

- Osório, I et al, Mat. Letters, 2012, 75, 200-203
- Cortez, J et al, J. Nano. Res., 2011, 13 (3) 1101
- Quaresma, p et al, Green Chem., 2009, 11, 1889–1893

Objectives

- Synthesis of ZnO and Si nanoparticles (NPs)
- Application of ZnO and Si nanoparticles on several textiles like cotton, wool, polyester and mixtures of polyester:wool and polyester:cotton
- Formation of a super-hydrophobic SAM using dodecylmethyltriethoxysilane (DTMS) as hydrophobic polymer

Methodology

ZnO NPs were synthesized using zinc acetate and NaOH. The solution was kept under magnetic stirring and at 60° in water for 1h.

SiNP were synthesized by the Stober method in ethanol.

Cotton samples were submersed in the NP solutions for 5 minutes and subsequently cured at 140°. A DTMS SAM was formed for 24h in ethanolic solution.

Sample characterization included Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM) and contact angle measurements.

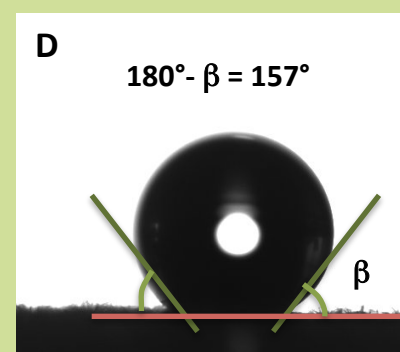
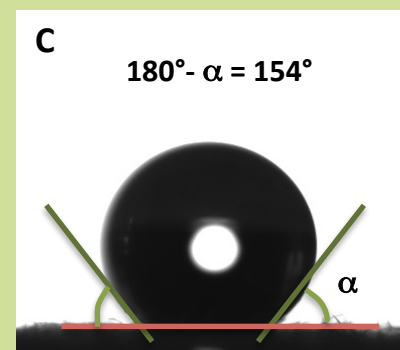
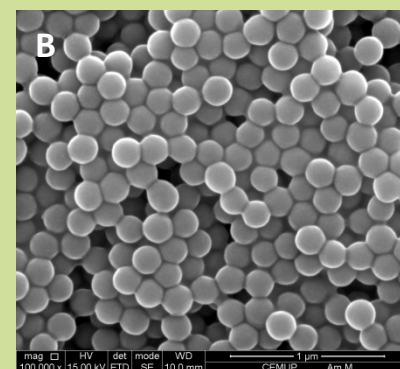
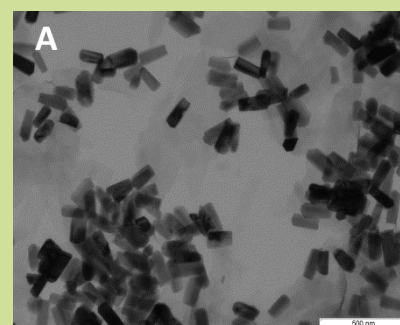
Expected Results

TEM revealed that NPs shapes were as expected. ZnO NPs (A) were 100 nm long rods. SiNPs (B) were spherical with an average diameter of 180 nm.

After the dip pad process on cotton, samples were analysed by SEM and both types of NPs could be observed deposited on textiles.

After the SAM formation it was observed that the contact angles of both samples were 154° and 157° respectively (C and D) showing that the samples were super-hydrophobic.

Large-scale processes are being optimized for application on other fabrics such as wool.



Funding: This work is part of the project QREN-ADI-5518-METALFUN, funded by the ERDF via QREN (Quadro de Referência Estratégico Nacional), a Portuguese funding body, in collaboration with Devan-Micropolis, Moreira da Maia, Portugal. The authors wish to acknowledge the collaboration of Eng. Raquel Vieira and Eng. Ricardo Vieira.