**Nano-engineered surface coatings on polymer substrates: the correlation between surface morphology, hydrophilic/hydrophobic properties and antibacterial activity**

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**Abstract**

The demand for surface engineered coatings with controlled hydrophilic/hydrophobic properties are ever-increasing owing to their diverse applications in fields such as biomedical technologies, engineering, sensors, automotive, defense, space, aerospace, apparels and so on. Previous research has shown that these properties can be tuned by both chemical and surface texture engineering. In this contribution, we will discuss in detail the tunability of titania (TiO2) coatings applied on polymer (polyethylene terephthalate (PET)) substrates and the role of chemical and surface engineering on their hydrophilic to hydrophobic transition. We will show that the inherent hydrophilicity of titania coatings can be altered to impart hydrophobicity by the applied chemical and surface engineering via doping or compositing and controlling coating procedure. We will further discuss the effect of these functionality modifications on the antibacterial activities against Gram-positive (Staphylococcus aureus) and Gram-negative (Pseudomonas fluorescens) microbial cultures, and will discuss the effect of nanocoating size, distribution, morphology, topography and doping/compositing on the activity. The correlation between surface hydrophilicity/hydrophobicity and antibacterial properties will be discussed.