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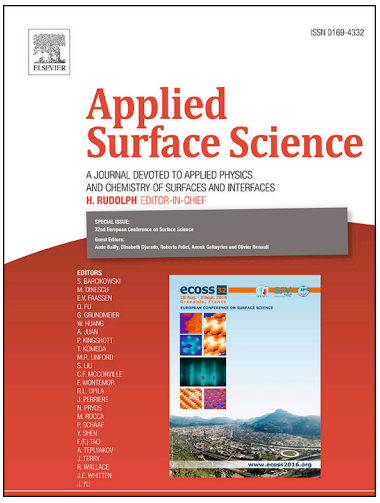

Full Length Article

Anti-bacterial and fluorescent properties of hydrophobic electrodeposited non-fluorinated polypyrenes

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Anti-bacterial and fluorescent properties of hydrophobic electrodeposited non-fluorinated polypyrenes

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Abstract

This work uses an innovative strategy to show a combination of highly hydrophobic films with fluorescence and anti-bacterial properties. Pyrene grafted with linear and branched alkyl chains of various length (from C_4H_9 to $C_{12}H_{25}$) were electropolymerized and their wetting behavior and surface morphology were first analyzed. The presence of microstructured spherical particles (1 µm) induces a high increase in the surface hydrophobicity ($\theta_{w,max}$ = 132º) even if the polymers are intrinsically hydrophilic (θ^Y = 79-88º), while the surface oleophobicity decreases. The emission of the pyrene monomers and polymers is in the green region (λ_{em} = 479 – 515 nm) and showed to be related with the size and the architecture of the chain. The differences in the aggregations and interactions of the oligomers induce a blue-shift and a thinner spectral band for the branched pyrenes compared to the linear ones. A crescent batochromic and hypsochromic shift are observed for linear and branched chains, respectively, as the number of carbons increase. The polypyrenes also have a potential application to serve as coatings towards to prevention of biofilm formation. A reduction between 30-70% was observed for the bacterial adhesion and between 91-94% for the biofilm formation for *S. aureus* and *P. aeruginosa* strains. Here we showed for the first time that hydrophobic surfaces bearing hydrocarbon chains without fluorine atoms can be used towards to repel bacteria. Furthermore, the pyrene molecules lead to fluorescent and microstructured hydrophobic surfaces by a one-step electropolymerization process and the combination of these properties enhances the range of applications for these surfaces.