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Abstract:
Microbial contamination are of great concern for many environmental, industrial and medical applications. Contact-active coatings with immobilized antimicrobial agents provide an efficient approach to limit the residual toxicity while maintaining efficient antibacterial properties. Antimicrobial polymers are of particular interest, as they generally possess long-term activity with a strong chemical stability. Among them, polycations with a proportionate amphiphilic character efficiently disrupt the outer and the cytoplasmic membrane which affords lysis of bacteria.
In the present research work, we covalently grafted ionenes onto different surfaces using a robust and efficient method based on polydopamine coating and diazonium salt induced polymerisation[1]. Ionenes are particularly good candidates since they possess quaternary ammoniums separated by hydrophobic fragments (PI x,y). Moreover, lack of toxicity[2] and ability to mitigate resistance development[3] has been demonstrated.
Detailed characterizations of the grafted surfaces have been performed (XPS, FTIR spectroscopy, surface energy measurements). We tested the adhesion and antibacterial properties of the grafted surfaces using *Staphylococcus aureus* (Gram+) and *Escherichia coli* (Gram-). Results obtained from microbiology tests demonstrated the bacteriostatic and pro-adhesive properties of the ionene grafted surfaces. We clearly showed that our treated surfaces with ionenes led to an important reduction of bacteria, depending on the length of the hydrophobic spacer in the ionene (Figure 1). Finally, these modular polymer coatings would be particularly attractive as inhibition traps, leading to tremendous potential application in medical and industrial field.

Keywords: dopamine, polydopamine, antibacterial polymers, polyionenes, bacteriostatic surfaces, bacterial adhesion.

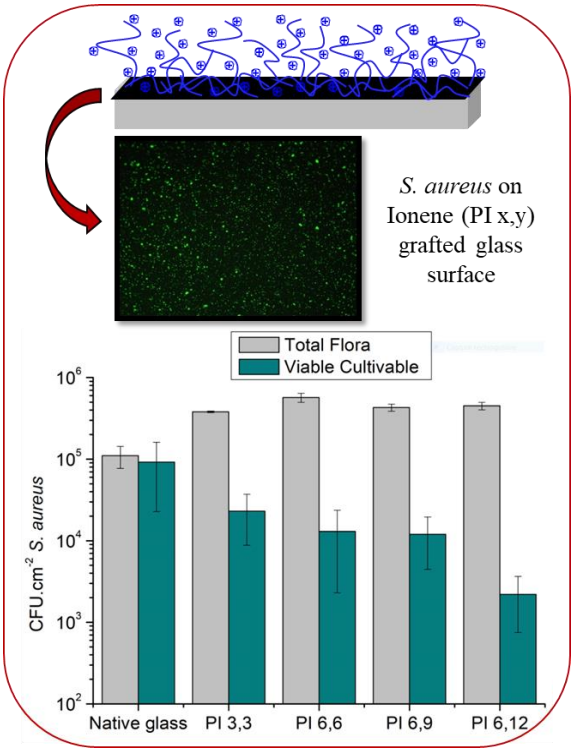

Figure 1: Upper : Epifluorescence microscopy of fluorescent *S. aureus* strains (total flora) on ionene surfaces. Lower : Enumeration of viable cultivable bacteria and total adherent bacteria of *S. aureus* strains in the presence of initial glass substrate and ionene surfaces.

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