A multi-approach of the bacteria non-adhesion phenomenon onto hydrophobic polymeric surfaces

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The concept of synthetic surfaces superhydrophobic appeared only very recently. They are characterized by water contact angles particularly high (greater than 120°) and can reach values up to 160 - 170°, values mostly induced by two factors, chemical nature and roughness. The latter parameter could be ranged from several hundred micrometers to a few nanometers [1-2]. Despite great potential of applications, these original surfaces so called self-cleaning surfaces as non-adherent are still poorly known in the field of bioadhesion.

Biofilm formation depends primarily on the adhesion of microorganisms to surfaces, phenomenon related particularly to the characteristics of solids. Roughness and topography of the support could have a particularly strong influence on proteins and cells adhesion [3-4] and an alteration of hydrophobic / hydrophilic balance of the material could significantly change its ability of bioadhesion and as consequence modifies the biocontamination processes [5].

In order to study the dependence of bioadhesion phenomenon on these material parameters, different polymeric surfaces have been modified until the high hydrophobic character, indeed the superhydrophobicity property was obtaining. For this purpose, polypropylene and polystyrene have been treated by RF or µwaves CF_4 plasma with different volumes, the results were compared according to the density of injected power. The effect of pretreatment such as mechanical abrasion or plasma activation was also studied. The modified surfaces were shown as hydrophobic, or even superhydrophobic. They were characterized by measurement of wettability and roughness at different scales, *ie* macroscopic, mesoscopic and atomic ones. It has been shown that a homogeneous surface at the macroscopic scale could be heterogeneous at lower mesoscopic scale. This was associated with the crystallinity of the material and induces a bioadhesion of certain bacteria on this type of surface materials despite its strong hydrophobic character.

This work was supported by the ANR Emergence Bio program.

References

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