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Water induced surface organization: from covalent anchoring of silica nanoparticles towards superhydrophilic hybrid surfaces

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Abstract:

Microbial adhesion is a complex phenomenon involving several physico-chemical factors. Among them, wettability is an important parameter in the adhesion of microbes to a surface and it has been demonstrated that both hydrophobic and superhydrophilic surfaces can reduce microbe anchoring to the surface. Specifically, microbes are spread out across superhydrophilic surfaces and their aggregation is prevented. In this work, we have grafted silica nanoparticles on polyethylene to modify its surface properties. First, plasma treatment was used to activate the polyethylene surface in order to promote the polymerization of acrylic acid. Then, amino functionalized silica nanoparticles were covalently attached to the surface via a coupling reaction between the amino groups of silica nano-particles and the carboxylic groups of poly(acrylic acid). Depending on the conditions used for the reaction, superhydrophilic films were obtained. This approach may be used to fabricate new antimicrobial surfaces.

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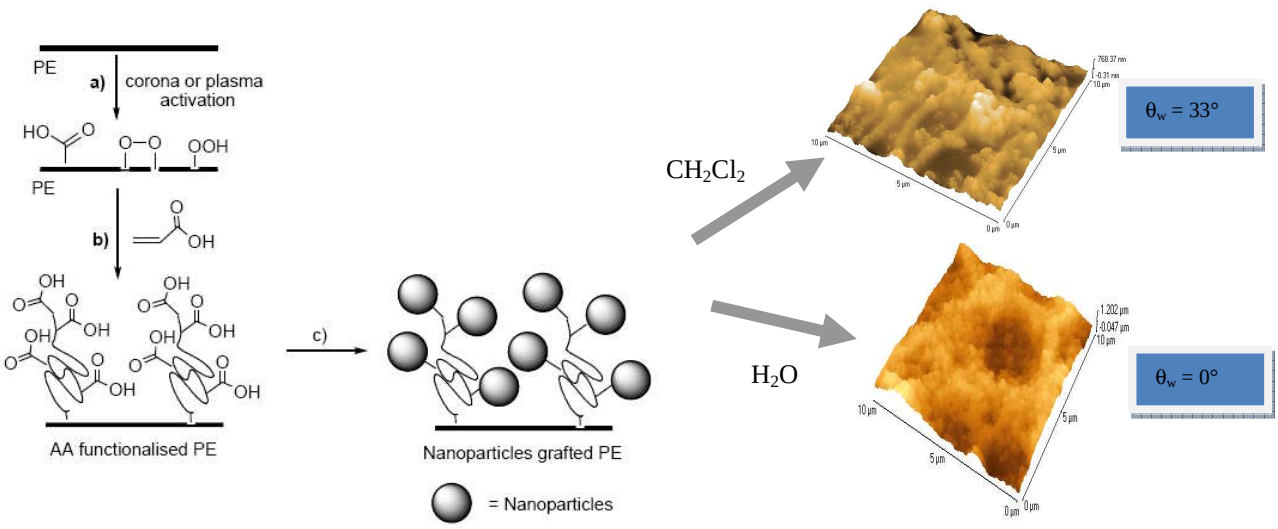

Fig. 1: Grafting of silica nanoparticles on polyethylene (synthetic pathway and AFM image)