

## Intimate Contact Between Hydrophobic Polymer Surface and Water: Electrostatic Pressure Induced Nanostructuration

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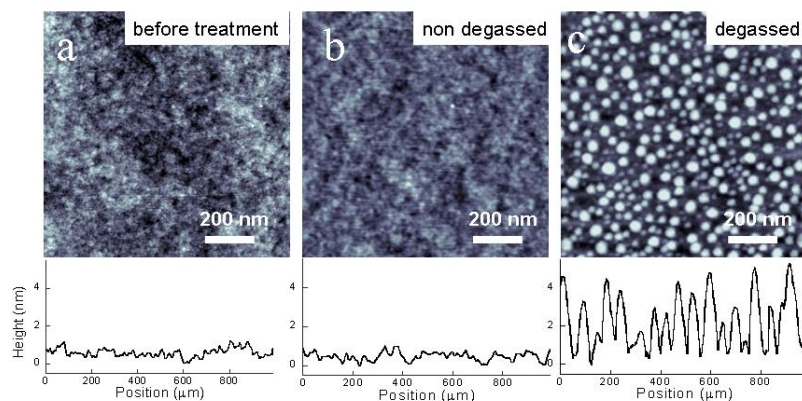
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When water is in contact with air in standard conditions, oxygen and nitrogen are dissolved in concentrations of 0.2 mM and 0.5 mM, respectively. It has been shown in the past that reducing the concentration of the dissolved gases may affect several interfacial properties. An extensive body of research has been devoted to the study of most of these problems. Particularly, the description of the intimate contact between water and hydrophobic surfaces has been the subject of controversial debates for the past few decades, probably due to its central role in many natural phenomena and technological applications. When hydrophobic surfaces are in contact with water in ambient conditions a layer of reduced density is present at the interface, preventing the intimate contact between the two phases [1]. Reducing the extent of this layer by degassing the water can have remarkable implications for the interaction between water and the hydrophobic surface. In the present work we show that the enhanced proximity between a hydrophobic polymer film and an aqueous solution induces a long lasting self-assembled nanostructure on the solid surface through the development of an electro-hydrodynamic instability, due to the adsorption of the water-ions at the interface. This instability and the self-assembled structure are controlled by the hydrophobic surface charge (which is determined by the pH and composition of the aqueous phase) and by the amount of dissolved gas [2,3].



AFM micrographs taken in air of polystyrene films as prepared (spin-coated) (a); after exposure to a non degassed (b) and degassed (c) solution of nitric acid in double distilled water at pH 1.5 and room temperature

This spontaneous nanostructuration evidences the presence of a mobile surface layer on the polymer film. It is probably a consequence of the larger free volume available to the surface polymer segments, which results from the lower chain density at the surface. This structuration is strongly affected by the interaction between the polymer film and the supporting substrate, with the influence of the substrate extending to film thicknesses of the order of the polymer chain size.

### References

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"I would like to participate to the best contribution contest, I attest that I am a PhD student and that I have not defended my thesis yet."