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Nanostructuring of Teflon-likes in Single Step Processes

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Abstract

It is a general trend nowadays, and is also an useful approach for many important industrial applications, to tailor polymers to the desired chemistry or nano-morphology. The combination of both, chemistry and morphology, is a surplus value. Particularly if it is possible to tune each feature independently of the other.

In the University of Bari we have recently developed several approaches for tuning the nano-structure and chemistry of polymer surfaces by cold plasmas. In this conference we will deal only of single step nano-structuring plasma-processes with three different approaches:

- modulated deposition discharges;
- afterglow deposition processes;
- etching/treatment processes of conventional polymers.

The nano-structured materials which are obtained have unique structures, feature super-hydrophobicity, can be easily modified in the surface chemistries, and open the domains of several applications, from *e.g.* de-icing and micro-fluidic devices to tissue engineering. As an example, the combined etching/treatment of polystyrene lead to a nanostructured fluorinated polymer where, by increasing the height and decreasing the density of the structures formed, there is a transition from a sticky super-hydrophobic to a slippery super-hydrophobic behavior.

In figure 1 are shown the various nano-morphologies of the fluorinated polymers obtained with the three above approaches.

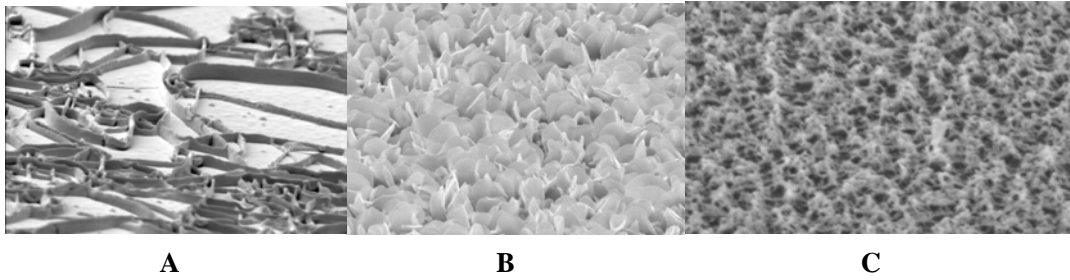


Fig. 1. SEM images of different nano-structured fluorinated polymers produced in single-step cold plasmas : (A) is a Teflon-like with crystalline ribbons, formed in a modulated C_2F_4 discharge; (B) is an afterglow Teflon-like, produced in the afterglow of a C_3F_6O (hexafluoropropyleneoxide) discharge; (C) is a fluorinated polystyrene produced with an etching/treatment plasma process with CF_4/O_2

keywords

nanostructuring. super-hydrophobicity, etching/deposition, teflon-like, afterglow, modulated plasma