PO1045

One step plasma texturing of polytetrafluoroethylene: surfaces with unique morphology and dynamic water repellent behaviour

Fabio Palumbo[1], Rosa Dimundo[2], Francesco Bottiglione[2], Giuseppe Carbone[3], Chiara Loporto[4], Pietro Favia[5]

[1]CNR NANOTEC, Bari, Italy [2]DMMM, Politecnico di Bari,, Bari, Italy [3]DMMM, Politecnico di Bari, Bari, Italy [4]Dpt of Chemistry University of Bari, Bari, Italy [5]dpt of Chemistry, University of Bari, Bari, Italy

fabio.palumbo@cnr.it

Mask-less plasma texturing has been widely investigated in the recent years as a way to properly design nano/micro-features on polymer surface to prepare water repellent surfaces. Commonly, beside a morphological modification of the polymer surface, the chemistry should also be carefully tuned if a superhydrophobic material with low water contact angle (WCA) hysteresis is desired. This target is generally reached by the addition of a hydrophobic coating on the plasma textured material. In this contribution, we present our last achievements on the plasma texturing of polytetrafluoroethylene (PTFE), material that so far has been scarcely studied with such a process. The rationale of the approach is using as substrate the most hydrophobic among the conventional polymers in order to: i) achieve a water repellent behaviour in one texturing step (avoiding the subsequent film deposition) ii) limit the deterioration of the superhydrophobic performance upon abrasion events; a bulk hydrophobic material should remain highly hydrophobic even after the damage of the texture.PTFE has been plasma textured with a single step oxygen-fed plasma process in a low pressure RIE reactor. Both wettability (WCA/drop bouncing) and chemical/morphological (XPS/SEM) characteristics of the samples have been investigated. It has been observed that an abrupt change in the texturing morphology appears when increasing time and/or power. In particular, while at low time and power input features have a typical hairy appearance, then at higher process duration unique “sphere-on-cones” structures appear. WCA measurements indicate that surfaces with very low water adhesion can be prepared in a broad range of experimental conditions. However, the surface response in terms of water drops impact at medium/high speed can be quite different, and under certain conditions the shortest reported time-of-contact for a textured superhydrophobic surface has been found

Keywords
plasma texturing
PTFE
superhydrophobic