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Superhydrophilic and Tribological Improvements of Polymeric Surfaces via PECVD Ceramic Coatings

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The main object of this study is the treatment of polymeric (PVC, PC) surfaces with the aim of inducing enhanced superhydrophilic characteristics together with nanohardness features; this would allow polymeric surfaces to have longer durability and prevent the accumulation of dirt on the surface which could disable the proper use of these polymeric surfaces.

Indeed plastic surfaces are difficult substrates to be covered effectively and functionalized, mainly due to their high sensitivity to heat treatments and irradiation in the UV-Vis range together with their inert behavior.

Their functionalization is achieved through the deposition of ceramic coatings such as titania (TiO_2), on the polymeric surfaces via PECVD (Plasma Enhanced Chemical Vapor Deposition) at low temperatures. Characterizations are carried out by contact angle analysis for the superhydrophilic characteristics, and by nanoindentation analysis for the tribological features. A cold PECVD discontinuous method allowed us to improve nanohardness, reaching a value of 1.39 GPa which is nearly ten times higher than that of the uncoated polymeric substrate, and seems a promising solution for improving uniformity of the coatings. Superhydrophilic behavior of the activated TiO_2 surfaces showed contact angle values lower than 10°.

Keywords: Cold PECVD, Polymeric substrates, nanoindentation, superhydrophilic.