Nanostructures for smart surfaces

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Nano-coating design leads to promising clean-technologies able to modify surface structure of engineering materials at a molecular level. One of the most fascinating phenomena in surface science is the extreme water repellence of a superhydrophobic surface (SHS), i.e. a surface characterized by high apparent contact angles, low contact angle hysteresis and high stability of the Cassie-Baxter air-or lubricants-trapping wetting state. These properties, together with the very low surface energy values (<5 mN/m) of the materials designed and produced at ISTEC CNR, also involve advanced repellence against oils, lubricants and emulsions. The coupling on the same surface of the repellence against liquids and fluids in a wide range of surface tension (from 72 to 20 mN/m) generates relevant “derived” properties allowing the application of such smart materials in many different sectors. In the field of mechanic and mechatronic, superhydrophobic, oleophobic surfaces – termed as amphiphobic ones - can provide a long-lasting barrier to prevent the decline of tribological performances with time, e.g. improving wear resistance, limiting drag and friction losses, and reducing the tribo-corrosion phenomenon. Some other relevant results obtained by the application in different environment of nanostructured smart materials produced at ISTEC CNR will be also presented.