SUPERHYDROPHOBIC NANOCOATINGS ONTO METAL SUBSTRATES

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Super- or ultrahydrophobicity is currently the focus of considerable research because of its scientific and technological interest. When studying the wettability of solid surfaces, their chemical composition and topography are crucial factors. Hydrophobicity is enhanced by surface roughness, and when the **water contact angle on a given surface exceeds 150º** we will consider we have a **superhydrophobic surface**. An example of this behavior is the Lotus plant: its leaves use the superhydrophobicity in a way they behave like self-cleaning surfaces. Water drops are almost spherical on these surfaces and they easily roll off, even with a very small tilt taking the contaminant particles with them. This effect is achieved by the double structure of the leaves' surface: they have a microstructure which is covered by hydrophobic wax crystals of around 1nm diameter; this reduces the contact area between the water and the solid making the water contact angle increase in comparison with a hydrophobic but smooth surface. Transferring this effect to artificial surfaces, there might be a lot of possible technical applications: **self-cleaning surfaces** for windows or façade paints; to prevent snow or ice from sticking on antennas; to make easy the washing up of several containers; to get biocompatible surfaces, self-lubricant surfaces, optically transparent superhydrophobic surfaces, antireflectant surfaces, etc..

In order to obtain superhydrofobic surfaces on several solid substrates (glass, metal, plastic…), we are investigating wet chemical methods such as dip coating and spraying. Our main interest is driven by the potential applications of superhydrophobic coatings onto metal substrates. As an example, superhydrophobic surfaces were obtained by the combination of different polyelectrolytes and nanoparticles (1) and applying them onto the surface of the substrate by layer-by-layer coating methods (2). To structure the surface on the nanoscale (required characteristic to obtain a superhydrophobic surface) we added to one of the polyelectrolyte solution selected nanoparticles. In the first experiments, we have already obtained surfaces with a water contact angle of 167º (see figure 1). In this poster communication, a complete set of results will be presented including the preparation and characterization of superhydrophobic coatings onto different solid substrates.

References:

(1) Rana M. Jisr, Hassan H. Rmaile, and Joseph B. Schlenoff. Angew. Chem. Int. Ed. 2005, 44, 782-785.

(2) Lei Zhai, Fevzi Ç. Cebeci, Robert E. Cohen, and Michael F. Rubner. Nano Letters 2004, Vol. 4, No. 7, 1349-1353

Figures:

Figure 1: Superhydrophobic surface obtained on a glass substrate. Water contact angle = 167º

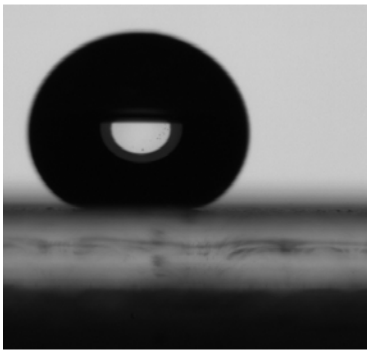

Figure 2: Atomic Force Microscopy Image of nanostructured superhydrophobic coating developed at CIDETEC.