UV degradation of water repellency on nanostructured aluminum and steel surfaces

Myronyuk O.[1], Rodin A.[2], Vanagas E.[3], Baklan D.[1], Raks V.[4]

[1] National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". Prosp. Peremohy, 37, Kyiv-03056, Ukraine. E-mail: d.baklan@kpi.ua

[2] State research institute Center for Physical Sciences and Technology, Savanorių ave. 231, Vilnius-02300, Lithuania.

[3] Evana Technologies, UAB, Mokslininkų st. 2A, Vilnius-08412, Lithuania.

[4] Taras Shevchenko National University of Kyiv, Volodymyrska St 64/13, Kyiv- 01601, Ukraine.

The use of nanotextured metal surfaces treated with low-energy organic substances is potentially effective in many applications, including outdoor surfaces exposed to solar UV radiation. Undoubtedly, the assessment of the sustainability of superhydrophobic properties when exposed to UV light is one of the key stages in the further development of this technology. The reporting phase of the research was aimed at creating a model of scalable surfaces. The surfaces of steel and aluminum were textured with a femtosecond laser to impart hybrid micro-nano roughness using the procedures described in [1] and [2]. Immediately after laser processing, steel surfaces contain anisotropic LIPSS textures with elements of 80-200 nm, and aluminum surfaces - 50-200 nm. These surfaces were treated with alkoxy silanes. Water repellency was evaluated by measuring the critical surface energy (25 mJ/m^2), water contact angles (greater than 155°) and sliding angles. The project has received funding from the Research Council of Lithuania, agreement S-LU-22-3, and the Ministry of Education and Science of Ukraine in the scope of the bilateral Lithuania-Ukraine program of cooperation.

1. *Wu, B., et al. (2009). Superhydrophobic surfaces fabricated by microstructuring of stainless steel using a femtosecond laser. Appl. Surf. Sci., 256(1), 61–66. https://doi.org/10.1016/j.apsusc.2009.07.061.*

2. *Song, Y., et al. (2018). Controllable superhydrophobic aluminum surfaces with tunable adhesion fabricated by Femtosecond Laser. Opt. Laser Technol., 102, 25–31. https://doi.org/10.1016/j.optlastec.2017.12.024.*