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Superhydrophobic glass surfaces

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Non-wettable surfaces with high water contact angles (WCAs) and facile sliding of drops, called superhydrophobic or ultrahydrophobic, have received tremendous attention in recent years both in the context of the protective coatings, antifoam agents and polymeric materials for special applications [1]. It is possible to modify a surface of different materials to obtain strong hydrophobicity by combining specific features of chemical compound, especially low surface energy and particular topographic characteristics.

Here we present the method of glass surface modification using different silicon organic compounds from the group of fluorinated silanes, polysiloxanes and silsesquioxanes (POSS). All of the above compounds were synthesised using hydrosilylation process. This method enabled us to synthesize functional polysiloxanes and silsesquioxanes containing mixed functional groups at different stochiometric ratios via tandem (successive) hydrosilylation of two respective olefins, e.g. fluorocarbofunctional allyl ether and allyl glycidyl ether or vinyltrimethoxysilane [2-5]. The hydrophobisation method involves the condensation reaction of the hydroxyl groups on the modified surface with reactive groups in the organofunctional compounds. The measure of hydrophobicity is contact angle determined by drop profile tensiometry. Values of contact angles exceeding 150° are typical for superhydrophobic surfaces. Such results were obtained for the glass surfaces modified by fluorosilane, polysiloxane or fluorinated POSS compounds together with silica nanoparticles using dip coating method or chemical vapour deposition.

Image of the water drop on superhydrophobic glass surface, contact angle Θ > 150°