One-step atmospheric-pressure plasma polymerization of superoleophilic and superhydrophobic surfaces for oil-water separation and self-cleaning function

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An efficient thin film is achieved for the purpose of oil-water separation and self-cleaning using an atmospheric-pressure plasma polymerization of hexamethyldisiloxane (HMDSO). Dielectric barrier discharge (DBD) configuration is used along with argon (Ar) to generate an Ar plasma jet. The thin film hydrophobicity is also strongly dependent on the gaseous shield. Nitrogen (N_2) rather than inert gases (Ar, and helium, He) had an excellent shielding effect against the interference of ambient air on the plasma jet. Glass substrate is used to coat for self-cleaning purpose. The oil-water separation membrane is prepared by plasma polymerization using textile fabric (TF) and offset printing paper (OPP). The wettability of TF and OPP is completely switched from superhydrophilicity to superhydrophobicity with the water contact angle (WCA) reaching 165 ℃ and the sliding angle of about 2 ℃ and oil contact angle (OCA) reached 0 ℃ at optimum conditions. The plasma treatment time and applied voltage are varied from 20 s to 300 s and 5 kV to 7.5 kV, respectively, to see the changing of WCA, oil contact angle (OCA), and the coating thickness and surface roughness.