# Multifunctional Nanoporous Aluminum Anodic Oxide

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Surfaces of metallic materials are degraded by environmental effects causing physical damage, contamination, bio-fouling and corrosion. Therefore, surface modifications of metals to enhance the resistance to the environmental effects is significant in the wide range of engineering systems and applications. We realized a multifunctional omniphobic surface on aluminum by impregnating immiscible oil in the chemically well-matched nanoporous anodic aluminum oxide. The immiscible oil stably retained in the nano-scale dead-end pores with a high-aspect-ratio stably inhibit contacts of other liquids to the porous solid structure regardless of the surface tension. Therefore, the surface shows a great repellency to sticky liquid and organic oils. Such repellency also protects the surface from the adhesion of bacteria, so that the surface shows anti-biofouling performance. In addition, non-wetting property of oil-impregnated surface significantly inhibit the penetration of corrosive liquid into the nanoporous oxide layer, thus the corrosion resistance is effectively improved. Moreover, due to the immiscible oil preventing the transportation of corrosive gas in nanopores, the surface shows an exceptional corrosion resistance in corrosive atmosphere. Such exceptional properties of oil-impregnated anodic aluminum oxide layer are maintained against harsh flow of water environment and physical damage on the oxide layer.