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Sustainability of Superhydrophobicity Under Pressure HOOMAN VAHEDI TAFRESHI, MOHAMED A. SAMAHA, MOHAMED GAD-EL-HAK, Department of Mechanical & Nuclear Engineering, Virginia Commonwealth University, Richmond, VA 23284 — Prior studies have demonstrated that superhydrophobicity of submerged surfaces is influenced by hydrostatic pressure and other environmental effects. Sustainability of a superhydrophobic surface could be characterized by both how long it maintains the trapped air in its surface pores, so-called "longevity," and the pressure beyond which it undergoes a global wetting transition, so-called "terminal pressure." In this work, we investigate the effects of pressure on the performance of electrospun polystyrene fibrous coatings. The time-dependent hydrophobicity of the submerged coating in a pressure vessel is optically measured under elevated pressures, up to 10 bar. Rheological studies are also performed to determine the effects of pressure on drag reduction and slip length. The measurements indicate that surface longevity exponentially decays with increasing pressure in perfect agreement with prior studies conducted at much lower pressures. It is found, however, that fibrous coatings could resist hydrostatic pressures significantly higher than those of previously reported surfaces. Our observations indicate that superhydrophobic fibrous coatings could potentially be used for underwater applications.

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