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Supporting Information

Durable, Flexible, Superhydrophobic and Blood-Repelling Surface for Use in Medical Blood Pumps

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***PDMS sample*:** PDMS in this study refers to Sylgard 184 mixed with the curing agent at a weight ratio of 10:1. The mixed PDMS was degassed in the vacuum chamber. Thin PDMS membrane was prepared on a glass substrate and cured at 100℃ for 2 hours.

***Dip-coated sample*:** 0.6 g hydrophobic SiO_2 nano particles and 1.0 g PDMS were mixed in 10 ml acetone following similar protocols in the literature.[1, 2] A uniform suspension was acquired by placing the mixture under ultrasonication for 20 minutes and magnetic stirring for 5 minutes. Thin slices of PDMS membrane were dipped into the suspension, and withdrawn slowly and vertically. Dip-coated samples were baked at 100 ℃ for 30 hours to cure the PDMS & SiO_2 layer.

***Spray-coated sample*:** Spray-coating samples were prepared using the same suspension solution as the dip coating. The suspension was sprayed onto the PDMS membrane using a spray gun (nozzle diameter: 0.5 mm; distance between the gun and PDMS membrane: 15 cm; air pressure: 0.4 MPa).[3] Spray-coated samples were cured at 100 ℃ for 30 hours before testing.

***Press-in-mold sample*:** Following the reported method in the literature,[4, 5] a control item was prepared using the press-in-mold method. Briefly, 0.6 g HP-SiO_2 particles were added to 1.0 g PDMS liquid; the sticky and pastry mixture was manually stirred to mix SiO_2 and PDMS. The mixture was fed into a mold cavity and cured at 100 ℃ under a clamping pressure of 10 MPa.

***Sand-casting SHP sample with F-PDMS*:** Trichloro(1H,1H,2H,2H-perfluorooctyl)silane (FDTS) was firstly mixed with PDMS at a mass ratio of 4% as the fluorinated-PDMS (F-PDMS).[6] After degasing, the mixture was pour onto the prepared SiO_2 mold, and cured at

100℃ for 30 minutes; after curing, PDMS was peeled from the mold to obtain a casted F-PDMS SHP sample.

Porosity: Porosity of the SiO_2 mold prepared in this study was measured to be 49.69 % ±1.47% (averaged over five measurements). Porosity can be estimated using the following equation.[7]

$$\text{Porosity}(\%) = \frac{V_{mold} - (V_{PDMS} + V_{SiO2})}{V_{mold}} \times 100 \quad (1)$$

where, V_{mold} is the measured volume of a prepared SiO_2 & PDMS composite mold sample, V_{PDMS} is the volume of the PDMS, and V_{SiO2} is the volume of SiO_2.

V_{PDMS} and V_{SiO2} are calculated using the following equations.

$$V_{PDMS} = \frac{m_{mold}}{(1+\delta)\cdot \rho_{\text{PDMS}}} \quad (2)$$

$$V_{SiO2} = \frac{\delta \cdot m_{mold}}{(1+\delta)\cdot \rho_{\text{SiO2}}} \quad (3)$$

where, m_{mold} is the measured mass of a SiO_2 & PDMS composite mold, ρ_{PDMS} is the PDMS density (0.965 g/cm^3), ρ_{SiO2} is the SiO_2 density (2.65 g/cm^3), δ is the mass ratio (0.6 in this study) between SiO_2 and PDMS when preparing the SiO_2 mold.

Blood anticoagulant: As for the anticoagulant, it was prepared by mixing 1.975g sodium citrate tribasic dehydrate (Sigma Aldrich C8532) and 1g HEPES (Sigma Aldrich H3375) in 50ml deionised water.[8] The anticoagulant was mixed with the blood at a volume ratio of 1:10 to prevent blood from clogging. Blood test was performed in four hours after blood collection.

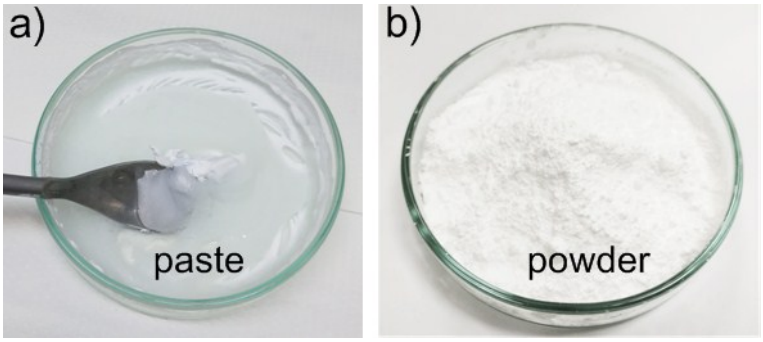

Figure S1. a) The HP-SiO_2 & PDMS composite paste before drying, and b) the HP-SiO_2 & PDMS composite powder after drying.

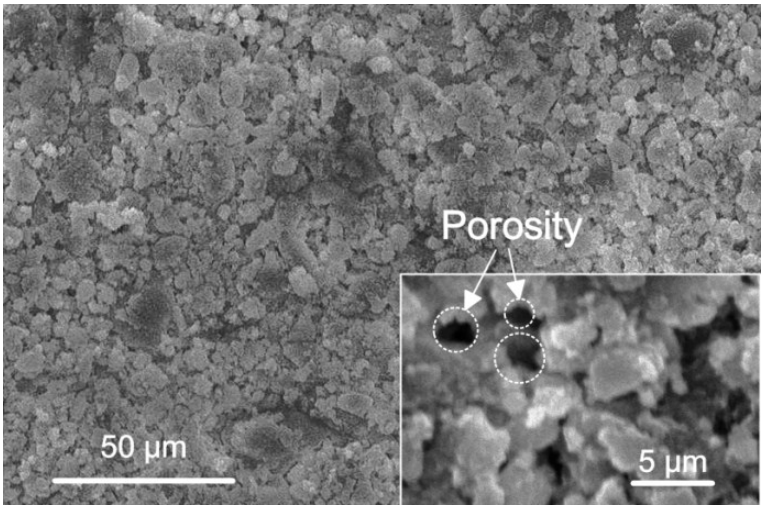

Figure S2. SEM image of the prepared SiO_2 mold, showing micro-particles and micro-porosities on the prepared SiO_2 mold.

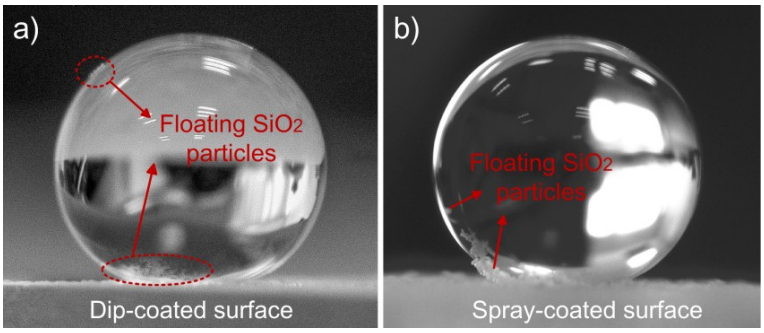

Figure S3. Free SiO_2 particles floating around a droplet a) on the dip-coated surface, and b) the spray-coated surface.

References

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