Supporting information

Why superhydrophobicity is crucial for a water–jumping microrobot? Experimental and theoretical investigations

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1) **Effect of $Cu_2(OH)_2CO_3$ concentration on the morphology of CuO coating on nickel foam**

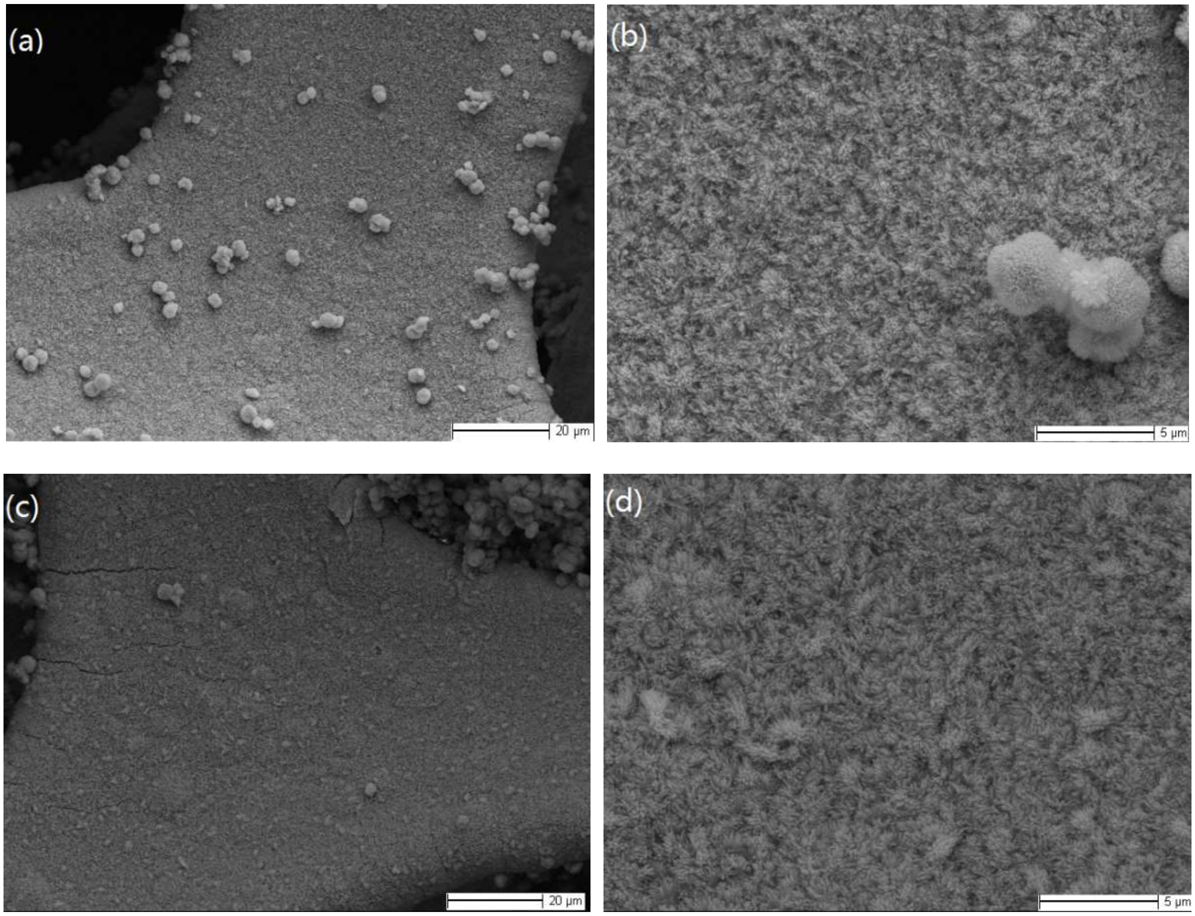

Figure S1. SEM images of the nickel foam sheets prepared in the ammonia solutions containing 5 mM (a, b) and 15 mM (c, d) basic cupric carbonate.

2) **Mechanical stability of the surface coating on the superhydrophobic nickel foam**

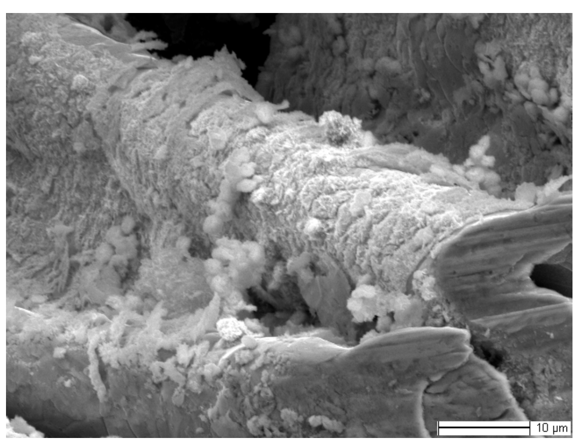

Figure S2. SEM image of a superhydrophobic nickel foam sheet cut by scissors.

3) **Movie the microrobot jumping on a water surface**

4) **Calculation of Reynolds number R_e for the supporting and actuating legs**

Reynolds number, the ratio of inertial force to viscous force, is a dimensionless factor describing the locomotion of an object moving on water. Generally, Reynolds number is defined as,

$$R_e = \frac{UL}{\upsilon}$$

where U is the mean velocity of the object relative to water, L is a characteristic linear dimension, and υ is kinematic viscosity. Then Reynolds number of the microrobot jumping on water is listed in Table S1.

Table S1. Reynolds Number of the legs of the water–jumping microrobot on water

	U	L	υ	R_e
Supporting leg	1.6 m/s	1.7 mm	1×10^{-6} m^2/s	2720
Actuating leg	0.6 m/s	1.7 mm	1×10^{-6} m^2/s	1020

5) **Calculation of the maximal immersion depth of the supporting legs**

The relationship between immersion depth (h) and upward force in the falling process was obtained according to equation (2). Theoretically, the supporting legs of the robot will not penetrate water surface until the immersion depth (h) reaches –7.0 mm, indicating that they can hold a maximum weight of 47 g on water (Figure S3).

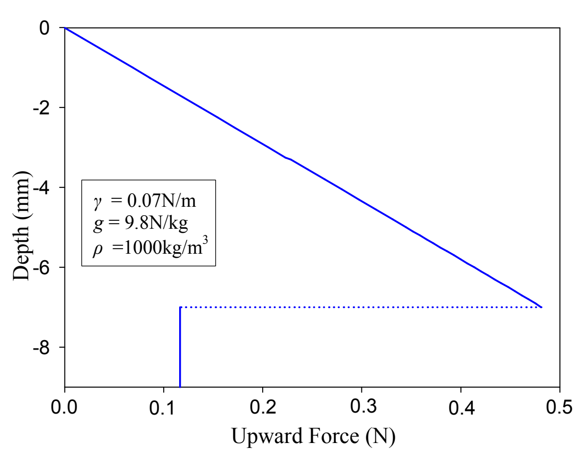

Figure S3. Relationship between upward force and immersion depth of the supporting legs in the falling process.

6) **Effect of contact angle on the maximal immersion depth and upward force of the supporting legs**

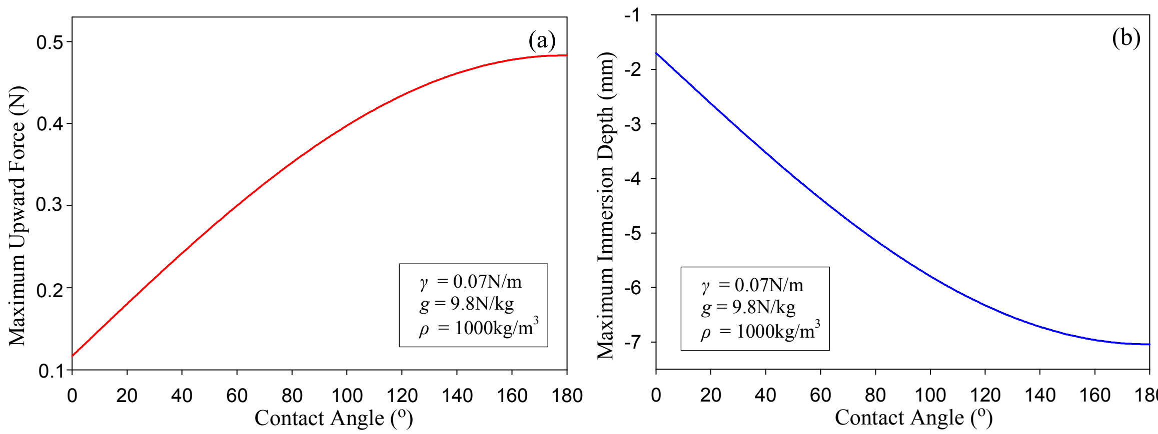

Figure S4. Influences of water contact angle on the (a) maximum upward force and (b) maximum immersion depth of the supporting legs.

In addition, we investigated the effect of contact angle of the supporting legs on their maximum upward force and maximal immersion depth. An increase in contact angle not only raises the upward force of the supporting legs but also enables them to immerse deeper beneath water surface without sinking, as shown in Figure S4.