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# Supporting Information

## Facile synthesis of a superhydrophobic and colossal broadband antireflective nanoporous GaSb surface

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**Determination of Diffusion constant from experimentally observed temporal evolutions of contact angle $\theta$, droplet radius $r_b$, and height, $h$**

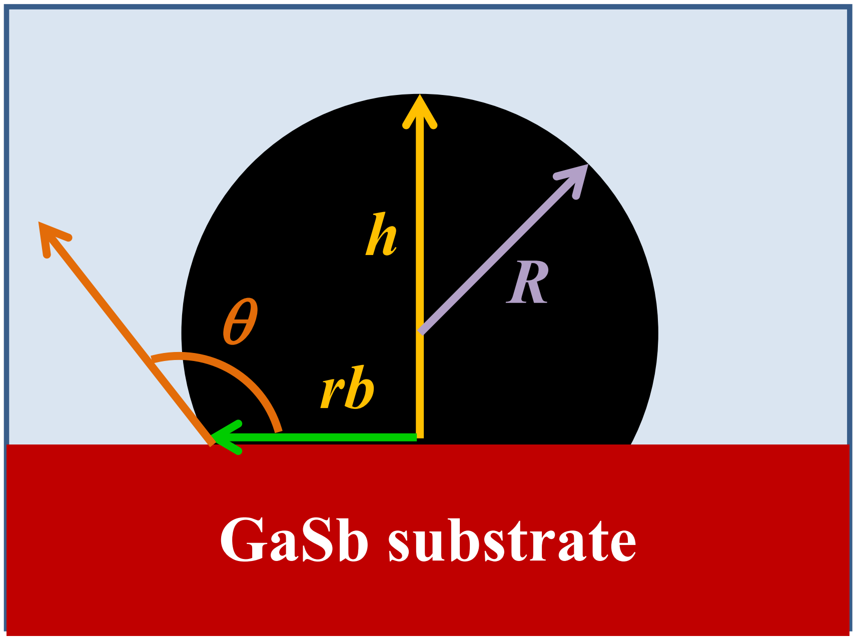


Fig. 1: Schematic diagram showing contact angle $\theta$, droplet radius $r_b$, and height, $h$

The rate of change in the volume of a water droplet is given by Fick's law:[1,2]

$$-\rho_L \frac{dV}{dt} = 4\pi R_S D \Delta c f(\theta), \quad (1)$$

where $V$ is the droplet volume, $D$ is the diffusion coefficient of the water droplet, $\Delta c (= C_s - C_\propto)$ is the difference between the concentrations of water vapor at the drop surface and at an infinite distance, and $\rho_L$ is the density of water. The function $f(\theta)$ can be chosen to be of the form $f(\theta) = (1 - cos\theta)/2$.[1]

From the geometry of a sessile drop, the height $h$ of a droplet, resting on a surface, having the form of a spherical cap can be expressed as:[1,3,4]

$$V = \frac{1}{6}\pi h\left(3r_b^2 + h^2\right) = \frac{\pi r_b^3(1 - cos\theta)^2(2 + cos\theta)}{3sin^3\theta}.$$

(2)

Hence, the rate of change in the droplet volume is given by:

$$\frac{dV}{dt} = \frac{\pi r_b^3}{(1 + cos\theta)^2}\frac{d\theta}{dt}.$$

(3)

Combining Eqs. (1) and (3):

$$\frac{d\theta}{dt} = \frac{\lambda sin^3\theta}{\pi r_b^3\,(1 - cos\theta)}.$$

(4)

In Eq. 2, $\lambda = 2\pi D\Delta c/\rho_L$. Integrating Eq. 2, one obtains:

$$F(\theta) = \ln\left[tan\left(\frac{\theta}{2}\right)\right] + \frac{1 - cos\theta}{sin^2\theta} = \frac{-4D\Delta ct}{\rho_L r_b^2} + F(\theta_o),$$

(5)

where $F(\theta_o)$ is a constant.[1,3] The evaporation of a water droplet from a solid surface can be analyzed by determining $F(\theta)$ as a function of *t*. Eq. 5 shows that $F(\theta)$ should vary linearly with *t*, having a slope of $-4D\Delta c/\rho_L r_b^2$. Further, it has been shown that, in order to consider the deviation in the shape of the water droplet from that of the spherical cap geometry, the slope (obtained from Eq. 2) has to be multiplied by a factor $(1 + \alpha)/2\alpha$, where $\alpha$ is related to the drop height as:[1,3,5]

$$h = \alpha r_b \tan(\frac{\theta}{2}).$$

(6)

Accordingly, we have determined the diffusion coefficient *D* using our measured values of $\theta$, $r_b$, and *h* at 295 K and 50% humidity.

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