Electronic Supplementary Material (ESI) for RSC Advances.
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Supplementary Information:

Section S1:

Debye-Scherrer's Equation for the calculation of lattice size from XRD data if mentioned in equation (S1) below.:

$$D = \frac{k\lambda}{\mu \cos\theta} \qquad (S1)$$

Where, **D** is the crystal size, **λ** is the wavelength of X ray incident , **μ** is the full width at half maxima **(FWHM)** (radians) and **θ** is the **Bragg angle** of the diffraction peak, K is **Scherrer constant** whose value range is **0.8 – 1**, λ is wavelength of radiation used in XRD, μ is integral breadth of a reflection peak in radians (**2θ**).

Section S2:

Williamson Hall (W-H) equation is used for evaluating strain induced in crystalline films due to the presence of imperfections. W-H equation is based on the premise that total peak broadening is a linear sum of individual size broadening and strain broadening (S3). The strain broadening component is calculated as follows:

$\varepsilon = \beta_{strain}/4 \tan\Theta$ (S2)

Supposing the particle size and lattice strain contribution to line broadening are not dependent to each other, the observed peak breadth can be written as the sum of size broadening ($\beta_{size} = \frac{k\lambda}{\mu \cos\theta}$) and strain broadeining ($\beta_{strain} = 4\varepsilon \tan\theta$) from equation S2.

$$\beta_{hkl} = \beta_{size} + \beta_{strain} \qquad (S3)$$

$$\beta_{hkl} = \frac{k\lambda}{\mu \cos\theta} + 4\varepsilon \tan\theta \qquad (S4)$$

Combining above equation, we get:

$$\beta_{hkl} \cos\theta = \frac{k\lambda}{\mu} + 4\varepsilon \sin\theta \qquad (S5)$$

Equation 5 is expressed as Williamson hall equation in which β_{hkl} is the total peak broadening that is observed from the experimental plot along the FWHM region of the peak. Crystalline size and strain values are evaluated with the help of XRD analysis software (X Powder ver. 2010.01.28 PRO)[52,53]

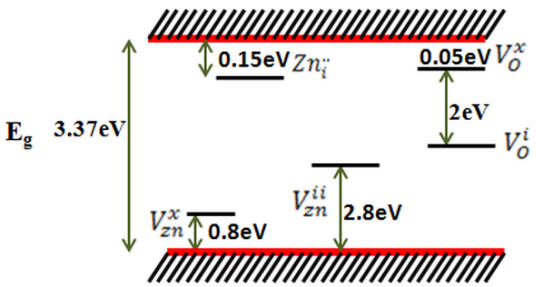

Figure S1: Band energy diagram of various defects in ZnO [30]

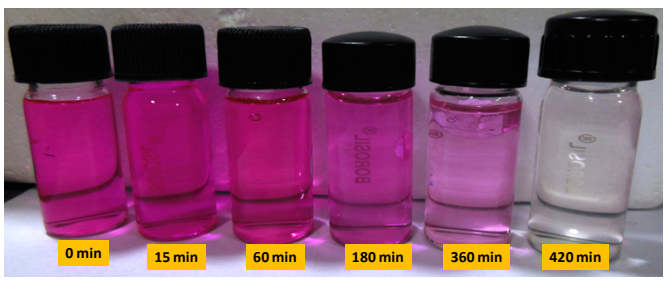

Figure S2 shows the Rh dye degradation with time 0,15,60,180,360,420 min respectively.

Contact Angle Hysteresis:

To evaluate the contact angle hysteresis value, contact angle value is measured at advancing front and receding front while varying the size of drop as 2, 4, 6, 8, 10 µl.

Figure S3 shows the variation in the contact angle as the size of the drop varies. In the advancing stage, contact angle decreases, increases and then decreases which is only due to the ultra high roughness of the film. Contact angle hysteresis is found out to be 4.2 which confirms the super-hydrophobic nature of the film.

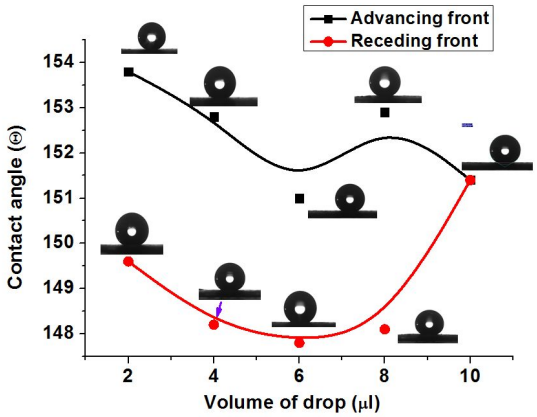

Figure S3 shows the variation in the contact angle value as size of the drop varies.