Electronic Supplementary Information

Anisotropic Liquid Penetration Arising from Cross-Sectional Wettability Gradient

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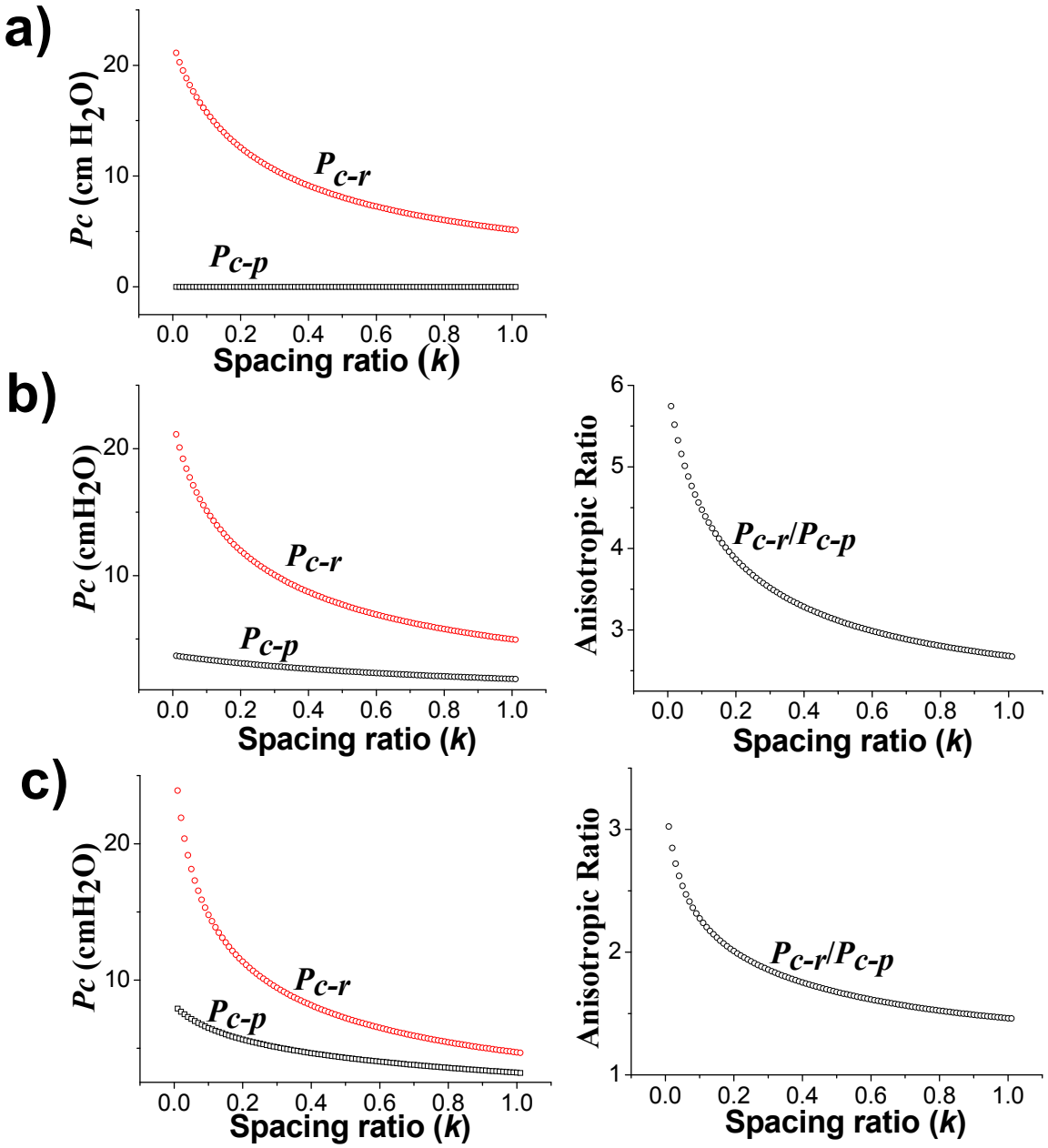
Figure S1 Anisotropic liquid penetration under a) high, b) moderate and c) low wettability gradient with quadratic dependence between $\theta(\varphi)$ and φ.



The left plots show the relationship between P_c and k, and the right plots give the relationship between anisotropic ratio ($P_{c\text{-}p}/P_{c\text{-}r}$) and k. A quadratic relationship between $\theta(\varphi)$ and φ is assumed, and $\theta(\varphi)$ varies within the range of $[0, \pi]$, $[\pi/6, 5\pi/6]$ and $[\pi/3, 2\pi/3]$ for a), b) and c), respectively. For a), $\theta_p(\varphi) = \varphi^2/\pi$, $\theta_r(\varphi) = (\pi - \varphi)^2/\pi$; b),

$\theta_p(\varphi) = \pi/6 + 2\varphi^2/3\pi$, $\theta_r(\varphi) = \pi/6 + 2(\pi-\varphi)^2/3\pi$; c), $\theta_p(\varphi) = \pi/3 + \varphi^2/3\pi$, $\theta_r(\varphi) = \pi/3 + (\pi-\varphi)^2/3\pi$. Cylinder radius is assumed to be 100 μm, and water surface tension γ (0.0728 N/m, 20 □) is used for calculation. It can be seen that the anisotropic ratio ($P_{c\text{-}p}/P_{c\text{-}r}$) can be improved by either decreasing the spacing ratio or increasing the wettability gradient.