Supplementary information

Electrowetting-driven solar indoor lighting (e-SIL): An optofluidic approach towards sustainable buildings

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Derivation of critical angle ranges from wavelength 0.4 μm ≤ λ ≤ 0.7 μm

Fig. S1 shows the relationship between wavelengths and refractive indices of the materials possibly used for our simulation studies using an optical design software (OpticStudio 14.2, ZEMAX). The information on the index variation of each material presented in Fig. S1 is useful to calculate the range of the critical angles (θ_c) required

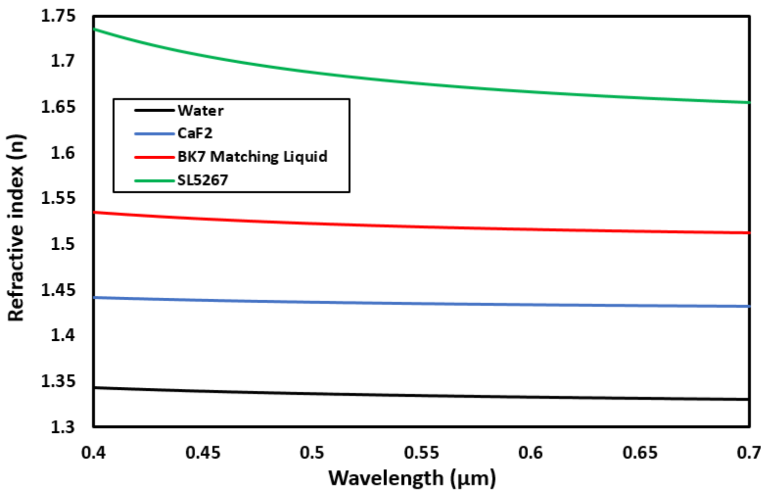

Fig. S1 Refractive index variation with wavelength for several prism materials such as SL-5267, BK7 matching liquid, CaF_2, and water used for simulation studies.

to induce total internal reflection at the prism angle of φ = 0° (i.e. the light-off mode). For our simulation studies, the three possible prism materials are selected as a high-index top prism materials, SL-5267 (n_2 = 1.67), BK7 matching liquid (n_2 = 1.52), and CaF_2 (n_2 = 1.43), while water is selected for the low-index bottom prism material (n_1 = 1.33 at λ = 589.3 nm). The critical angle can be calculated as $\theta_c = \sin^{-1}(n_2 / n_1)$, where n_1 and n_2 are the refractive index of the bottom and top prism materials at a specific wavelength. Table S1 shows the critical angle calculated at a given wavelength as well as the refractive index ratio (r at λ = 589.3 nm) between the top and bottom prism materials. The last column in Table S1 presents the incident angle (θ) we selected the angle slightly

Table S1. The critical angles (θ_c) calculated at a given wavelength and the refractive index ratio (r at λ = 589.3 nm) between two prism materials.

	Critical angle at a given wavelength				
	θ_c at 400 nm	θ_c at 589.3 nm	θ_c at 700 nm	r at λ = 589.3 nm	Incident angle, θ
SL-5267	50.71°	53.03°	53.48°	1.25	53.7°
BK7 Matching Liquid	61.06°	61.51°	61.58°	1.14	61.8°
CaF_2	68.68°	68.39°	68.28°	1.08	68.9°

larger than the incident angle calculated for the outmost ray to achieve the light-off mode at the prism angle of $\varphi = 0°$. For our simulation studies, the incident angle of SL-5267 is set to be slightly larger than the maximum critical angle (i.e. $\theta = 53.7° \geq \theta_c = 53.48°$) to induce total internal reflection at the prism angle of $\varphi = 0°$ for light-off mode. Similarly, the incident angle is set to be $\theta = 61.8° \geq \theta_c = 61.58°$ for BK7 matching liquid and $\theta = 68.9° \geq \theta_c = 68.28°$ for CaF_2 to ensure total internal reflection at the light-off mode.