

**Table S1.** Properties of four dyes used in the DCMD experiments.

Dye name	Formula*	MW** (g mol <sup>-1</sup> )	Chemical Types	Charge	$\lambda_{\max}$ (nm)	pH*** *	Company
Methylene Blue (MB)	C <sub>16</sub> H <sub>18</sub> N <sub>3</sub> SCl	319.85	Basic	+1	664	5.2	Shanghai Zhanyun Chemical Co., Ltd
Crystal Violet (CV)	C <sub>25</sub> H <sub>48</sub> N <sub>3</sub> Cl	407.99	Basic	+1	590	6.8	Shanghai Zhanyun Chemical Co., Ltd
Acid Red 18 (AR18)	C <sub>20</sub> H <sub>11</sub> N <sub>2</sub> Na <sub>3</sub> O <sub>10</sub> S <sub>3</sub>	604.46	Acid, Anionic	-3	507	9.1	Shanghai Zhanyun Chemical Co., Ltd
Acid Yellow 36 (AY36)	C <sub>18</sub> H <sub>14</sub> N <sub>3</sub> NaO <sub>3</sub> S	375.38	Acid, Azo- dye	-1	527	7.2	Shanghai Zhanyun Chemical Co., Ltd

\* Structures of dyes used in this study are presented in **Fig. S1** (Supplementary data); \*\*MW: molecular weight; and \*\*\* Measured with 100 mg/L of each dye.

**Table S2.** Water (DI) and dye contact angles (CAs) of different membranes (°).

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Membrane	DI	MB	CV	AR18	AY36
PVDF-0.22	120.2 ± 0.3	117.2 ± 2.3	117.0 ± 0.4	120.0 ± 1.1	118.2 ± 1.5
PVDF-0.45	117.9 ± 1.0	116.2 ± 1.7	114.7 ± 0.8	118.2 ± 0.4	117.4 ± 1.7
PTFE	137.9 ± 1.0	135.3 ± 1.8	136.6 ± 0.3	135.4 ± 2.2	135.7 ± 2.0

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