

*Supplementary Materials for*

Development of Diffusive Gradients in Thin-films with Mixed  
Binding Gel for in-situ Monitoring of Artificial Sweeteners in  
Waters

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**MS Conditions for Chemical Analysis:**

Source temperature: 120 °C; Desolvation gas temperature: 300 °C; Desolvation gas: 800 L/h; Cone gas: 150 L/h; Scan mode: MRM; Ionization: ESI positive; Capillary voltage: 2.0 kV; Sampling cone: 40 V.

### **Extraction Procedures for Wastewater Samples from WWTP:**

All the water samples were filtered using 0.7  $\mu\text{m}$  glass fiber filters (GF/F, Whatman) before extraction, and the filtered samples were subsequently spiked with the relevant internal standard before. Final extracts were filtered using a 0.22  $\mu\text{m}$  membrane filter and stored at  $-18\text{ }^{\circ}\text{C}$  before analysis.

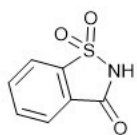
Chromabonds HR-X SPE cartridges (500 mg, 6 mL) were applied for the extraction of ASs. The SPE cartridges were preconditioned with 6 mL of methanol and 6 mL of Milli-Q water. Then, 500 mL of water samples were adjusted to pH =2 and passed through the cartridges at a flow rate of approximately 10 mL/min. Subsequently, the cartridges were rinsed with 10 mL of Milli-Q water and dried for 2 h under a vacuum. Finally, the SPE cartridges were eluted with methanol ( $2 \times 5\text{ mL}$ ). The eluent was evaporated to dryness and re-dissolved with 1 mL methanol.

Table S1 Basic information of selected Artificial Sweeteners.

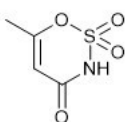
Compound	CAS Number	Formula	Molecular Weight	p <i>K</i> <sub>a</sub>	Log <i>K</i> <sub>OW</sub>
Saccharin, SAC	82385-42-0	C <sub>7</sub> H <sub>5</sub> NO <sub>3</sub> S	182.99	1.31	0.91
Acesulfame, ACE	33665-90-6	C <sub>4</sub> H <sub>4</sub> NO <sub>4</sub> S	162.99	2.00	-1.33
Cyclamate, CYC	139-05-9	C <sub>6</sub> H <sub>12</sub> NO <sub>3</sub> S	178.05	1.71	-1.61
Sucralose, SUC	56038-13-2	C <sub>12</sub> H <sub>19</sub> Cl <sub>3</sub> O <sub>8</sub>	396.01	-3.0/11.8	-1.00

Table S2 Physical and chemical properties parameters of commonly used resins.

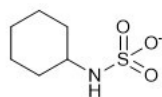
	<b>XAD18</b>	<b>XDA1</b>	<b>WAX</b>	<b>MAX</b>	<b>HLB</b>	
	<b>Physical Properties</b>					
	Matrix	Macroporous, Crosslinked DVB	Macroporous, crosslinked PDVB	PS/DVB	PS/DVB	PNVP/DVB
	Type	Adsorbent	Adsorbent	Ion exchange	Ion exchange	Adsorbent
	Physical Form	White, opaque, spherical beads	Red brown, spherical particles	White, particles	White or yellowish, particles	White, particles
<b>Typical Properties</b>	<b>Nitrogen BET</b>					
	Surface Area	~700 m <sup>2</sup> /g	~1100 m <sup>2</sup> /g	~600 m <sup>2</sup> /g	~600 m <sup>2</sup> /g	~600 m <sup>2</sup> /g
	Pore Diameter	~150 Å	~90 Å	~300 Å	~300 Å	~300 Å
	Exchange Intensity	-	-	0.6 meq/g	0.9 meq/g	-
<b>Suggested Operating Conditions</b>	<b>Particle Size</b>					
	Particle Diameter	425 ± 50 um	750 ± 50 um	50 ± 5 um	50 ± 5 um	40 ± 5 um
	Variable Coefficient	≤ 1.7%	-	< 5%	< 5%	< 5%
	Particle Density	1.03 g/mL	0.75 g/mL	-	0.3 g/mL	-
	<b>Maximum Operating Temperature</b>	150°C (302°F)	150°C (302°F)	60°C (140°F)	60°C (140°F)	60°C (140°F)
	<b>pH Range (Application)</b>	1-14	1-14	1-14	1-14	1-14
	<b>pK<sub>a</sub></b>	-	-	~6	>18	-
<b>Storage Condition</b>	room temperature	room temperature	room temperature	room temperature	room temperature	



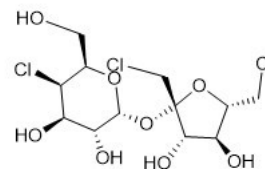
Saccharin (SAC)



Acesulfame (ACE)

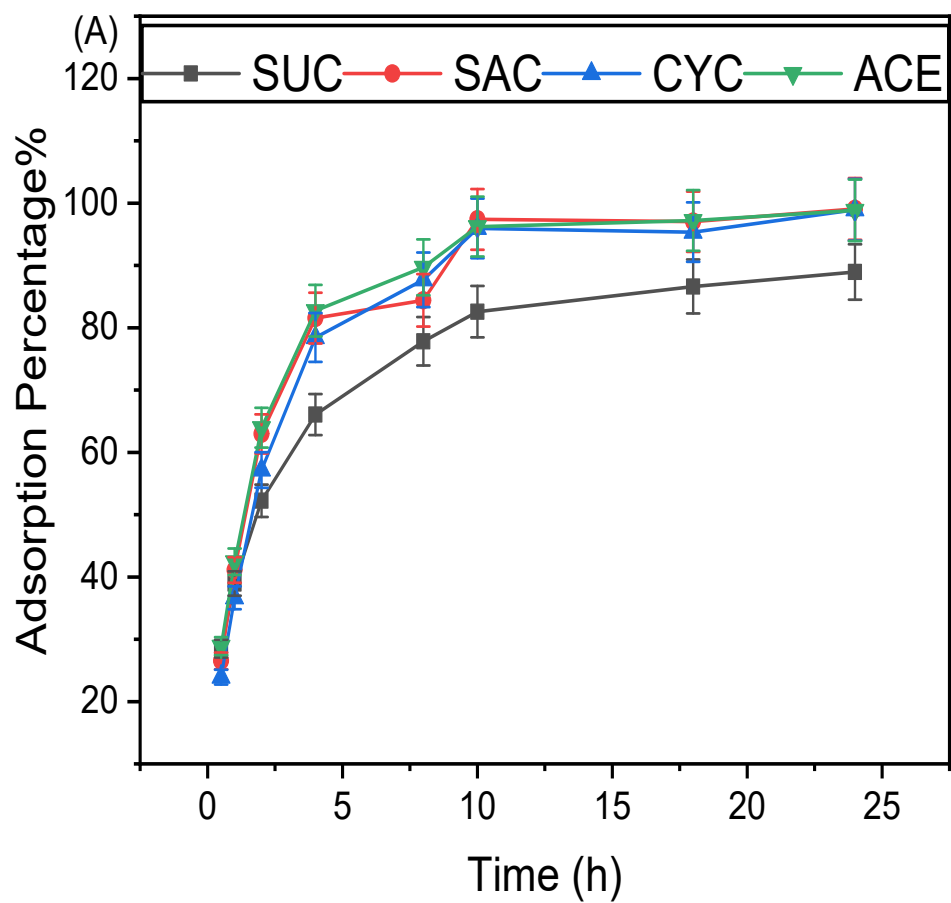


Cyclamate (CYC)



Sucralose (SUC)

**Fig S1.** Structures of four ASs investigated in the present study.



**Fig. S2.** Plot A: Uptake kinetics of SUC, SAC, CYC, and ACE onto WAX: XDA1 gels over the corresponding time in ASs solutions of  $100 \mu\text{g L}^{-1}$  10 mL.

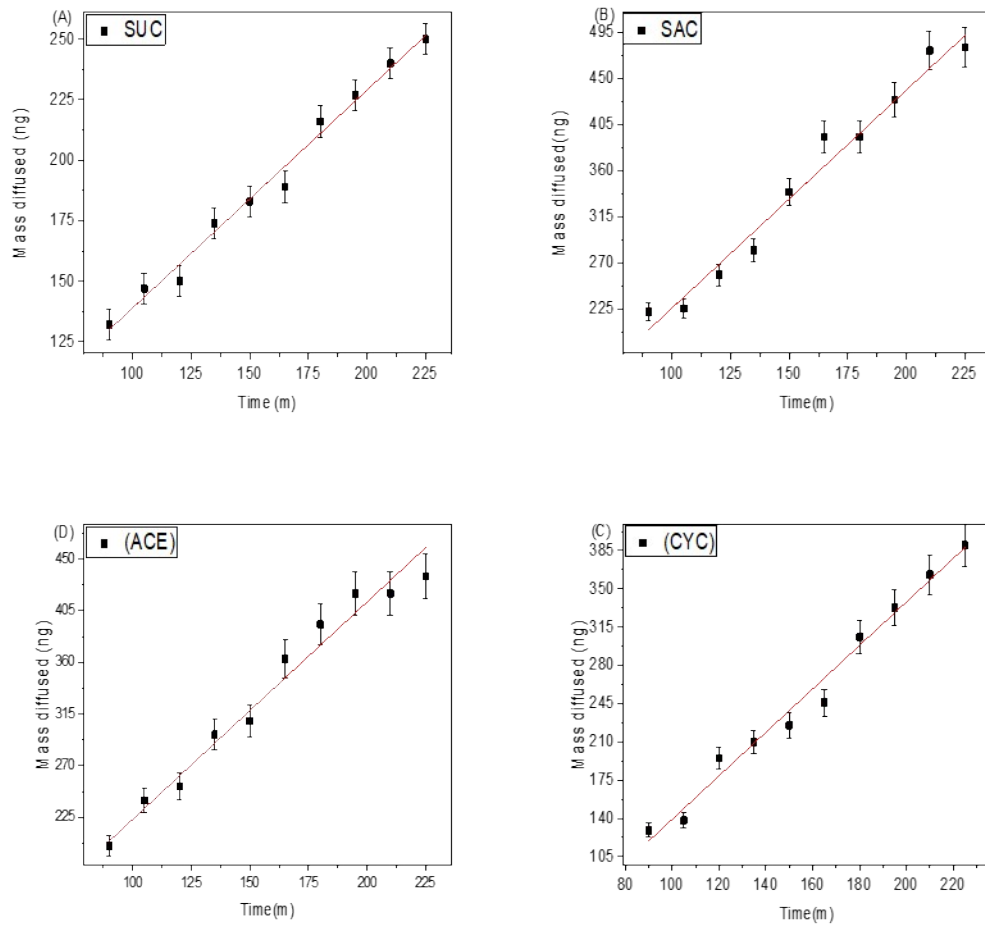


Fig. S3. AS masses diffused through PES (filter membrane) and Agarose (diffusive gel) at different intervals of time at 23°C, and ionic strength of 0.01 M. Error bars was calculated from the standard deviations of three replicates.