

Table 1S Operating steps for the flow manifold in Fig. 2.

Step	FIA section					SIA section				Duration (s)
	Action	PP1	PP2	Position of IV	Position of SV	Action	SP ^a	Position of SLV1	Position of SLV2	
1	Draw out vapor from MBL-VP unit	OFF	ON	Load	(W1+W2)-SV-D	• Aspirate 1,000 µL of H ₂ O(1) into syringe	↓	MC2-SLV1-HC	H ₂ O(1)-SLV2-SP	10
2	Mixing of sample and H ₂ SO ₄ + Draw out vapor from MBL-VP unit	ON	ON	Load	(W1+W2)-SV-D	• Changing SLV1 position • Aspirate 215 µL of air into HC	↓	air-SLV1-HC	HC-SLV2- SP	3 2
3	Mixing of sample and H ₂ SO ₄ + Draw out vapor from MBL-VP unit	ON	ON	Load	(W1+W2)-SV-D	• Changing SLV1 position • Aspirate 100 µL of H ₂ O(2) into HC	↓	H ₂ O(2)-SLV1-HC	HC-SLV2- SP	3 1
4	Mixing of sample and H ₂ SO ₄ + Draw out vapor from MBL-VP unit	ON	ON	Load	(W1+W2)-SV-D	• Changing SLV1 position • Deliver 100 µL of H ₂ O(2) into A1 (with 215 µL of air in line a)	↑	A1-SLV1-HC	HC-SLV2- SP	3 3
5	Mixing of sample and H ₂ SO ₄ + Draw out vapor from MBL-VP unit	ON	ON	Load	(W1+W2)-SV-D	• Changing SLV1 position • Aspirate 215 µL of air into HC	↓	air-SLV1-HC	HC-SLV2- SP	3 2
6	Mixing of sample and H ₂ SO ₄ + Draw out vapor from MBL-VP unit	ON	ON	Load	(W1+W2)-SV-D	• Changing SLV1 position • Aspirate 100 µL of H ₂ O(2) into HC	↓	H ₂ O(2)-SLV1-HC	HC-SLV2- SP	3 1
7	Mixing of sample and H ₂ SO ₄ + Switch SV position	ON	ON	Load	IV-SV-D	-	hold	H ₂ O(2)-SLV1-HC	HC-SLV2- SP	3
8	Mixing of sample and H ₂ SO ₄ + Inject donor zone to rest in reservoir D	ON	ON	Inject	IV-SV-D	• Changing SLV1 position • Deliver 100 µL of H ₂ O(2) into A2 (with 215 µL of air in line b)	↑	A2-SLV1-HC	HC-SLV2- SP	3 3
9	Sample held in reservoir D	OFF	OFF	Load	IV-SV-D	• Gas diffusion process for A1 and A2	hold	A2-SLV1-HC	HC-SLV2- SP	7
10	Sample held in reservoir D	OFF	OFF	Load	IV-SV-D	• Gas diffusion process for A1 and A2 + Changing SLV1 position • Draw the following zone stack from A1 into HC: (65 µL of headspace air) + (100 µL of H ₂ O(2)) + (215 µL of air in line a) + gas diffusion process continued for A2	↓	A1-SLV1-HC	HC-SLV- SP	3 4
11	Sample held in reservoir D	OFF	OFF	Load	IV-SV-D	• Gas diffusion process for A2 + Changing SLV1 position (3 s in 6 s) • Draw the following zone stack from A2 into HC: (185 µL of headspace air) + (100 µL of H ₂ O(2)) + (215 µL of air in line b)	↓	A2-SLV1-HC	HC-SLV2- SP	6 5
12	Draw out donor solution and vapor from MBL-VP unit	OFF	ON	Load	(W1+W2)-SV-D	• Changing SLV1 position • Send the following zone stack from HC into C4D: (185 µL of air) + (100 µL of H ₂ O(2) or A2) + (215 µL + 65 µL of air) + (100 µL of H ₂ O(2) or A1) + (215 µL of air) (<i>see the inset of Fig. 3</i>)	↑	C4D-SLV1-HC	HC-SLV2- SP	3 9
13	Draw out donor solution and vapor from MBL-VP unit	OFF	ON	Load	(W1+W2)-SV-D	-	hold	C4D-SLV1-HC	HC-SLV2- SP	60

10 s^b

20 s^c

Table 2S Parameter range and the selected condition for operating the MBL-VP system.

Parameter	Range	Selected condition
Volume of liquid acceptor (μL)	100 – 200	100
Volume of liquid donor (μL)	100 – 200	200
Acid concentration (mol L^{-1})	0 – 1.5	1.5
Ethanol content (% v/v) for adjusting the sample/standard medium	0 – 20	15
Diffusion time (s)	A1: 10 – 70 A2: 20 – 80	A1: 10 A2: 20
Aeration	(i) With aeration (ii) Without aeration	Without aeration
Headspace volume (mL)	2.82 – 10.60	6.36
Venting flow rate (mL min^{-1})	15 – 20	20

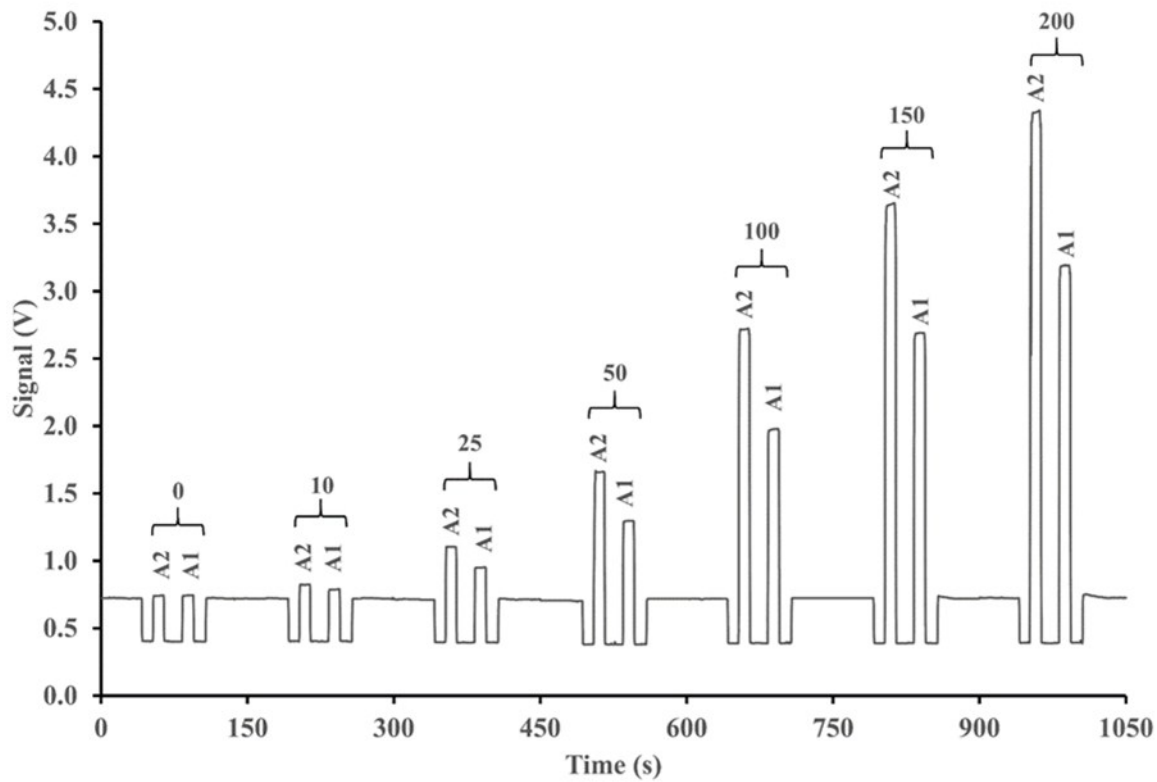


Fig. 1S Examples of signal profile showing the signal of acceptor A2, followed by A1, both obtained for various concentrations of sulfite standard (0-200 mg L⁻¹ sulfite).