

Supporting Information

Development and integration of an ultra-miniaturized Gas Chromatograph prototype based on Lab-on-a-chip Micro Electro Mechanical Systems for space exploration missions

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17 **Table S1-S1: Chromatographic results obtained with 2.2.4-trimethylpentane and methane tests**
 18 **performed on the MEMS column used at different pressure relative to P_{atm} .**

19 The mobile phase velocity u is also presented.

Inlet Pressure (kPa)	2.2.4-trimethylpentane						Mobile phase velocity u (cm.s ⁻¹)	
	Retention Time T_r		N		HETP (mm)		Average (n=3)	1 σ (n=3)
	Average (n=3)	1 σ (n=3)	Average (n=3)	1 σ (n=3)	Average (n=3)	1 σ (n=3)		
40	0.69	2.52E-04	2682	3.8	1.9	0.003		
50	0.55	8.39E-04	2920	12	1.7	0.007		
75	0.37	4.62E-04	3355	8.5	1.5	0.004	26	5.86E-01
100	0.28	5.77E-05	3881	67	1.3	0.022	35	8.60E-02
125	0.22	3.00E-04	4495	9.3	1.1	0.002	44	2.69E-01
150	0.19	0.00E+00	5381	80	0.93	0.014	53	1.94E-01
175	0.16	1.15E-04	7487	596	0.67	0.056	61	2.62E-01
200	0.14	5.77E-05	7684	385	0.65	0.034	70	2.62E-01
225	0.13	1.15E-04	8275	43	0.60	0.003	79	8.73E-01
250	0.12	5.77E-05	8164	100	0.61	0.008	89	5.50E-01
300	0.10	0.00E+00	7414	121	0.67	0.011	108	2.81E+00
350	0.09	3.61E-04	5192	102	0.96	0.019	126	1.91E+00
400	0.08	5.66E-04	4292	857	1.2	0.266	140	1.36E+00

21 **Calculation S2-S1: Calculation method of the quantity of injected compounds using the different**
22 **sampling loop volumes**

23 This calculation was done using the ideal gas law:

24
$$PV = nRT$$

25 P is the pressure in the loop set at atmospheric pressure (100000Pa)

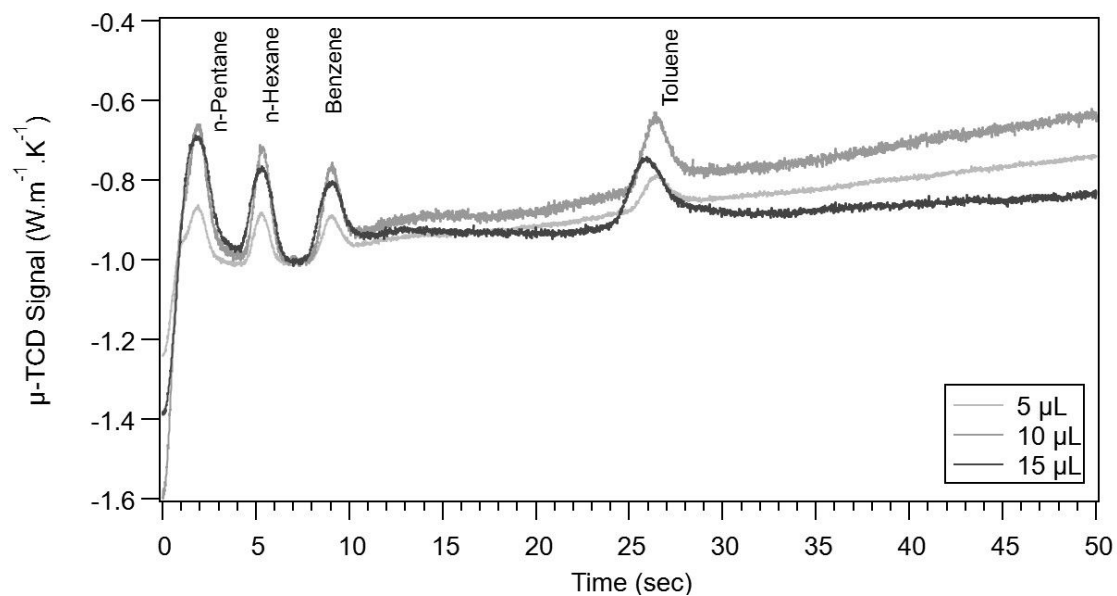
26 V is the loop volume (m3)

27 n is the number of mols (nmol)

28 R is the ideal gaz constant (8.3144 J·K⁻¹·mol⁻¹)

29 T is the ambient temperature (K)

30 Given the concentration of each compound in the gas mixture (100 ppm), $n = C(\text{ppm}) \times \frac{PV}{RT}$



31

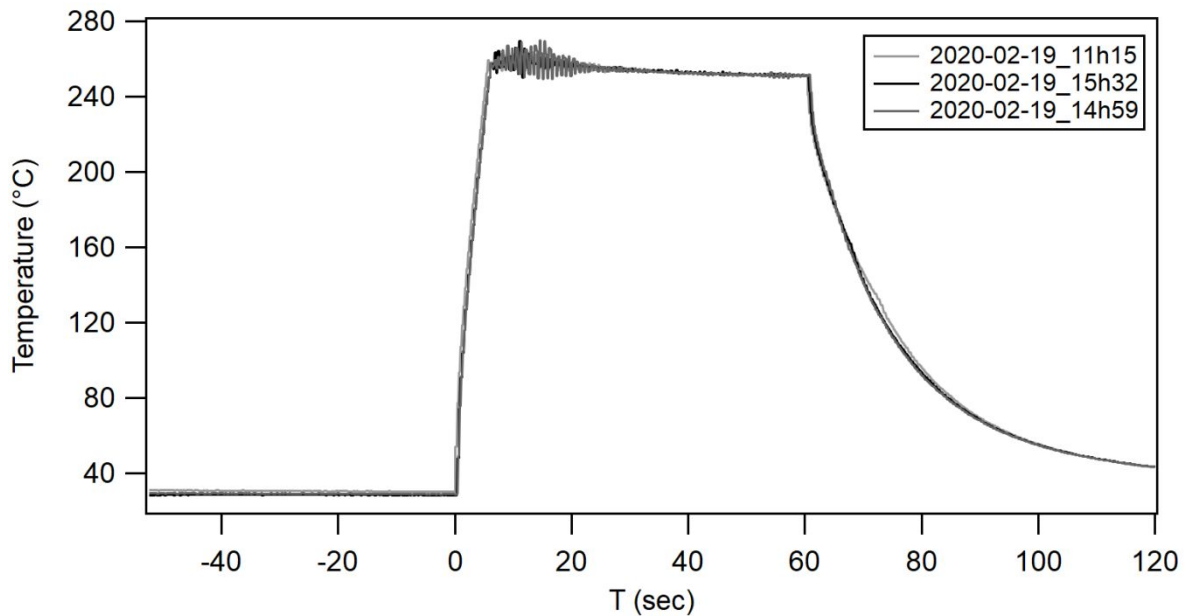
32 **Figure S2-S1: Obtained chromatographs with μ-TCD detector using the sampling loops of 5, 10 and**
33 **15 μL coupled to the column.**

34 T = 0 corresponds to the injection time of analytes in the column (following the preconcentrator
35 desorption. We observe that the retention time are lower than those obtained with NGD. This
36 difference is maybe due to a lower gas velocity in NGD because the column outlet was coupled to the
37 TCD inlet using 1/32" inox tube (ID=0.12mm). However, the TCD was coupled to NGD inlet using fused
38 silica capillary tubes with lower internal diameters (there is no different way to connected the NGD
39 detector). This reduced internal diameter has an effect on a lower gas velocity before the NGD and
40 therefore the retention time will be delayed for NGD comparing to TCD. Further tests should be done
41 with the TCD uncoupled to NGD to confirm the obtained retention times.

42 **Table S3-S2: Results obtained with μ -TCD detector using three different loop injection with the**
 43 **column.**

Sampling loop volume (μL)	Compound	Peak height ($\text{W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$)	$W_{1/2}$ (sec)
5	Pentane	0.11	0.40
	Hexane	0.13	0.50
	Benzene	0.10	0.64
	Toluene	0.08	0.82
10	Pentane	0.25	0.42
	Hexane	0.28	0.46
	Benzene	0.21	0.60
	Toluene	0.16	0.56
15	Pentane	0.25	0.84
	Hexane	0.22	0.73
	Benzene	0.14	0.72
	Toluene	0.12	1.12

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45

46

Figure S3-S2: Temperature profile for the preconcentrator.

47 T_0 is the time corresponding to the trap heating. We observe an oscillation during the first 20 seconds
 48 because the PID regulation is done over few seconds after a flash heating and the heaters take 20 sec
 49 to stabilize the plateau value.