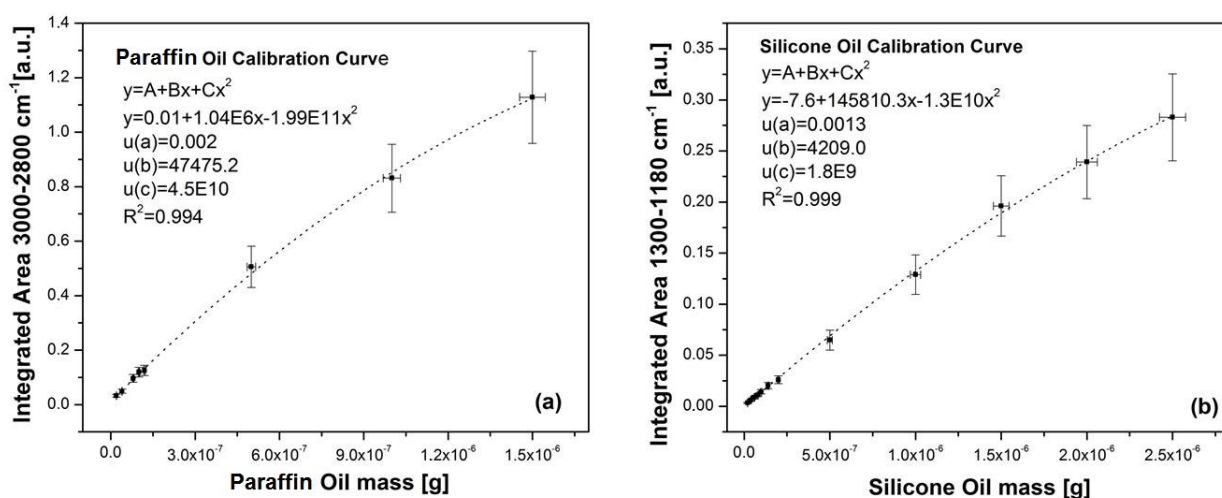


1 Supplementary information

2 FTIR Calibration curves

3 The calibration procedure based on the Lambert-Beer's law which relates the absorbance at a
4 specific wavelength with the standard concentration is reported in ref [16]. The calibration curves
5 obtained and taken into consideration for the presented work are shown in Fig.1S a-b.

6 Fig. 1S



7 8 Homogeneity of the spread films

9 The 5 point map (center and four cardinal points) was performed by FTIR and Raman spectroscopy
10 for 5 films of paraffin oil of different thickness. This test was made with the aim of verifying the
11 uniformity of contaminant deposition practiced by the spin coating method. The 5 spectra collected
12 in 5 different regions of the sample provided results in terms of integrated peak area at 2800-3000
13 cm^{-1} within a relative standard deviation lower than 13 % for each analyzed film.

14 Tab 1S

15

	Paraffin oil concentration * [g/l]	Mean integrated peak area 2800-3000 cm ⁻¹ (n=5) **	Relative standard deviation *** %
IR mapping	0.1	0.04	12.24
	0.25	0.10	8.39
	0.50	0.19	4.56
	0.75	0.26	5.01
	1.00	0.34	9.10
RAMAN mapping	0.1	264.28	5.26
	0.25	728.02	10.24
	0.50	1215.40	5.71
	0.75	1765.90	4.51
	1.00	2771.26	11.06

*Concentration of spread paraffin oil solution

**Mean integrated area of 2800-3000 cm⁻¹ peak in five different surface points

***Relative standard deviation of mean integrated area (RSD%=(SD/mean)100)

16

17 Spin coating repeatability

18 A test to check the repeatability of the spin coating method was also performed showing a relative
 19 standard deviation lower than 15 %. As an example, 0.1 g/l Paraffin oil solution was deposited on
 20 the surface of the CaF₂ window and the contamination was quantified by FTIR spectroscopy via the
 21 previously set calibration curve (Fig.1S). The procedure was repeated five times. An average
 22 contamination level of 75±8 ng/cm² was obtained. The results of the five repetitions are shown in
 23 Tab 2S and they present a relative standard deviation of 14.4 %. A *t*-test to verify the casual
 24 variation of data was performed. The positive results of the *t*-test attest that no systematic error
 25 affects the data and that the methodology can be considered reproducible at a confidence level of 99
 26 %.

27

Tab 2S

Intagrated peak area 3000-2800 cm ⁻¹	Surface Contamination [ng/cm ²]	Expanded uncertainty (k=2)* [ng/cm ²]	t sper** (98%)
0.028	76	8	0.18
0.031	57	8	3.75
0.038	77	8	0.47
0.032	79	8	0.89
0.039	86	8	2.21

*Expanded uncertainty with coverage factor of k=2

**two tail t value calculated ($t=(x_m-\mu)/(s/\sqrt{N})$); critical value of the t distridution at 98% with 4 degree of freedom t=3.75

28

29 Candidate reference materials FTIR analysis

30 In the following table (Tab. 3S) the analytical results of the quantification of contaminant obtained by means
31 of the previously shown FTIR calibration curves (Fig. 1S) are shown. The standard materials are prepared by
32 spreading paraffin oil and silicone oil solution with a known concentration on CaF₂ round plate (2 cm
33 diameter) by spin coating. The increasing concentration of the spread solution leads to an increasing amount
34 of contaminant deposited on the surface.

35 Tab 3S

Paraffin Oil	Surface contamination**	Expanded uncertainty (k=2)***
Concentration* [g/l]	[ng/cm ²]	[ng/cm ²]
0.1	64	4
0.25	192	8
0.5	416	7
0.75	610	27
1	812	32

Silicone Oil	Surface contamination**	Expanded uncertainty(k=2)***
Concentration* [g/l]	[ng/cm ²]	[ng/cm ²]
0.1	77	3
0.25	218	7
0.5	418	15
0.75	756	30
1	948	35

*Concentration of spread contaminant solution

**Contamination level revealed on the CaF₂ surface after spin coating

***Expanded uncertainty of FTIR analysis with coverage factor of k=2

36

37