

SUPPLEMENTARY INFORMATION

Colloids and surfaces A

Adsorption of benzyldimethyldodecylammonium chloride onto stainless steel surface using the Quartz Crystal Microbalance and the depletion methods: An optimisation study

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Figure S1. Changes in the frequency as a function of time during the adsorption an aqueous C12BDMAC solution having a concentration of 0.05 times the cmc onto stainless steel coated crystals at 25°C, at the third overtone, using the stepwise protocol.

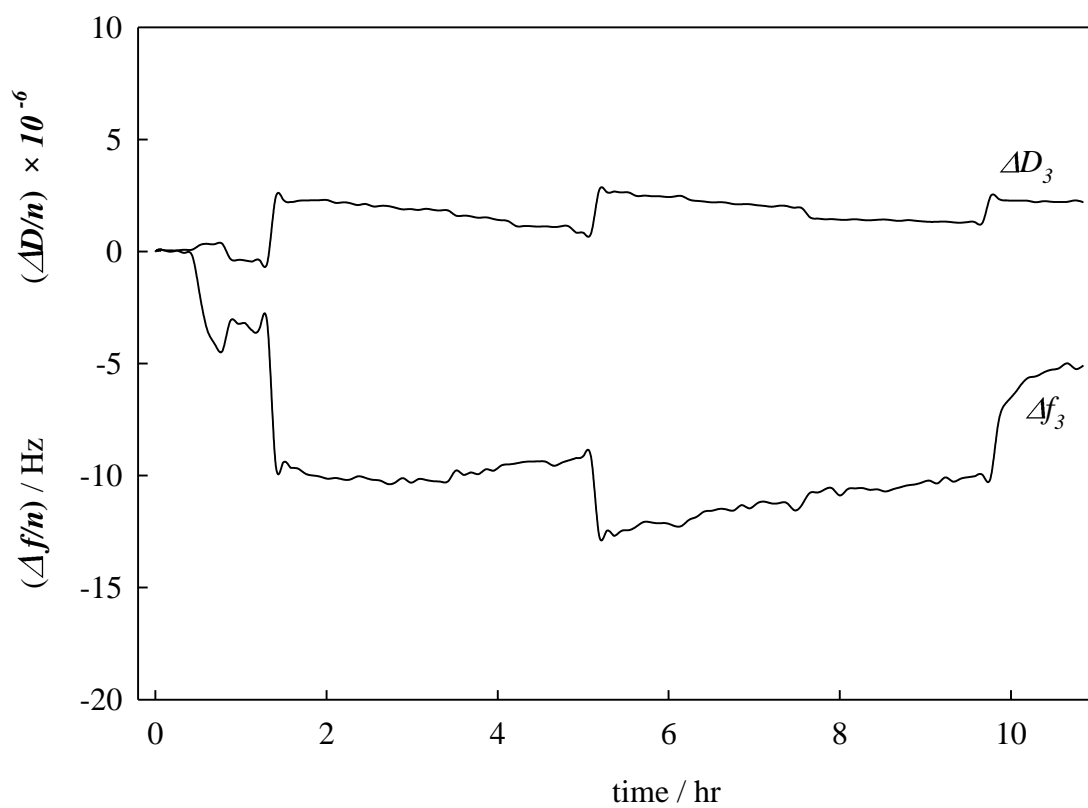
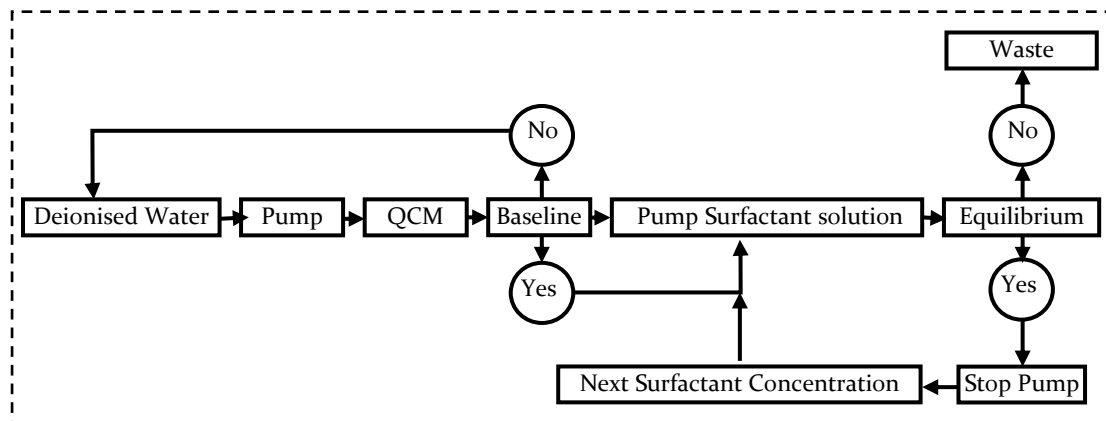
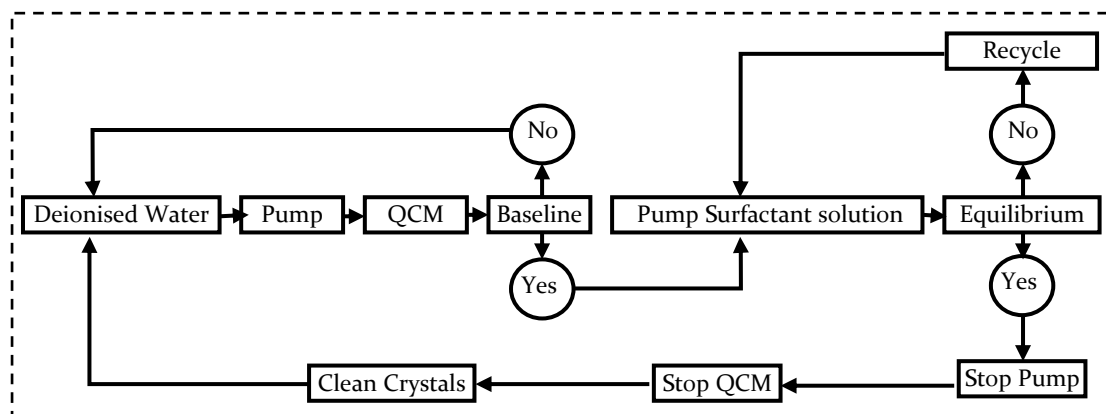


Figure S2. A schematic diagram describing the three investigated experimental protocols used to perform the adsorption measurements.

(A) Stepwise Protocol



(B) Loop Protocol



(C) Batch Protocol

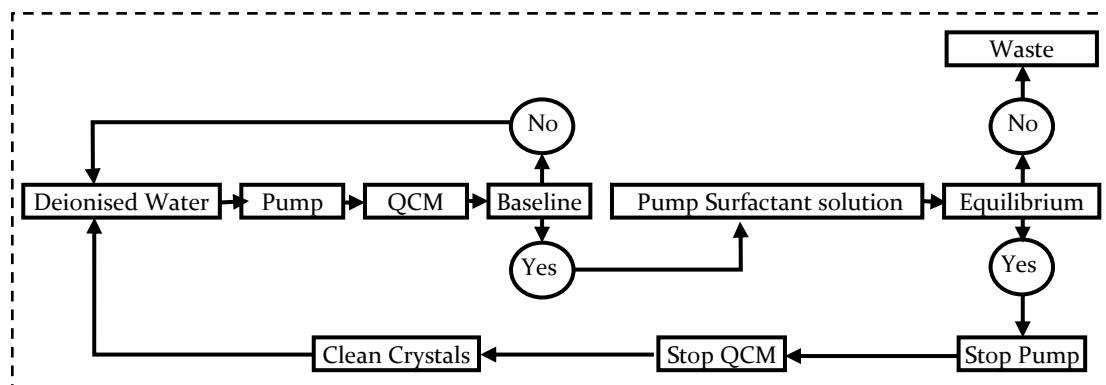
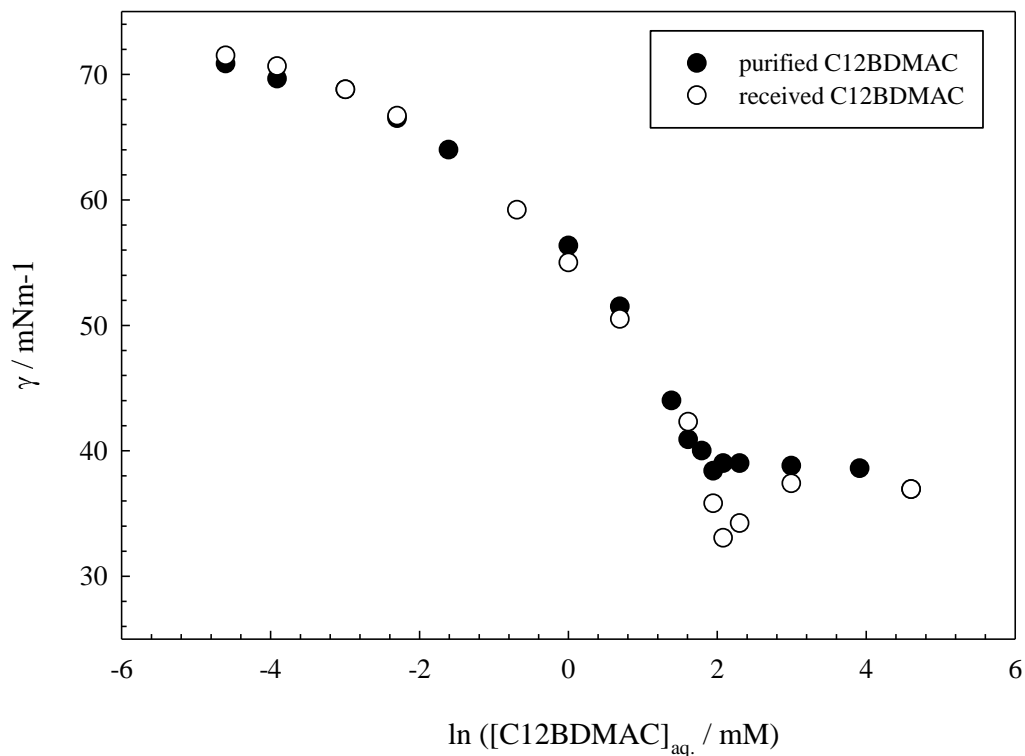


Figure S3. Plot of surface tension versus the natural logarithm of received and purified C12BDMAC concentration at 25 °C.



Experimental

Surface tension measurements were performed using the du Noüy ring method on a K12 processor tensiometer (Krüss, Germany) thermostatted by an LTD6G water bath (Grant, UK). The platinum/iridium du Noüy ring ($R = 9.545 \text{ mm}$, $r = 0.185 \text{ mm}$) was placed in the apparatus, then the liquid was added to a glass vessel within a thermostatted cell and left to equilibrate. Using the fully automatic measurement method, the tensiometer dips the ring into the liquid and then pulls it out automatically by raising and lowering the height of the thermostatted cell. As the ring is pulled from the liquid surface, a meniscus forms. The force required to raise the meniscus reaches a maximum when the tangent at the point of wetting is perpendicular to the liquid surface. The measurement was repeated until it reaches a plateau. The reproducibility was within $\pm 0.1 \text{ mN m}^{-1}$. Prior to each measurement, the ring was

cleaned in a solution of 10 wt. % KOH in ethanol then rinsed with Milli-Q water and finally heated in a blue Bunsen burner until the ring glowed white.

Table S1. Density and viscosity values for the investigated C12BDMAC surfactant solutions at 25 °C.

[C12BDMAC] / cmc	Density / g cm ⁻³	Viscosity / cP
0.01	0.9952	0.886
0.02	0.9955	0.888
0.05	0.9958	0.890
0.08	0.996	0.893
0.1	0.9961	0.894
0.2	0.9964	0.895
0.5	0.9967	0.899
0.8	0.9969	0.907
1	0.997	0.911
2	0.9973	0.919

Table SError! No text of specified style in document.2. Fitting parameters for the two-stage Langmuir adsorption isotherm of C12BDMAC from aqueous solutions onto stainless steel-coated crystals.

Parameters	QCM		Depletion
	$\Delta f_{lowestD}$	$\Delta f_{average}$	
k_1 / M^{-1}	7890	8990	7890
k_2 / M^{-1}	5.52	5.52	5.53
$\Gamma_{1(max)} / \text{molecules nm}^{-2}$	0.58	0.98	0.18
$\Gamma_{2(max)} / \text{molecules nm}^{-2}$	33.77	50.77	10.77
R^2	0.98	0.96	0.98