A model study of enhanced oil recovery by flooding with aqueous solutions of different surfactants: how the surface chemical properties of the surfactants relate to the amount of oil recovered.

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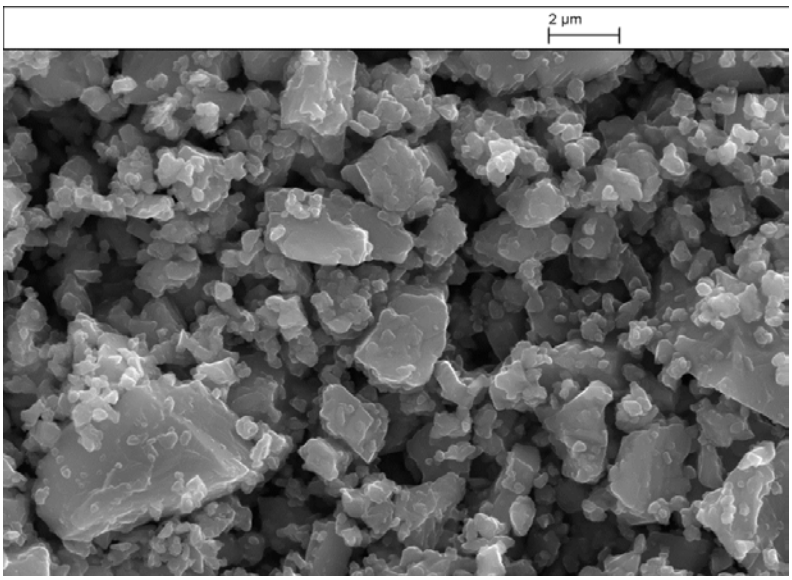
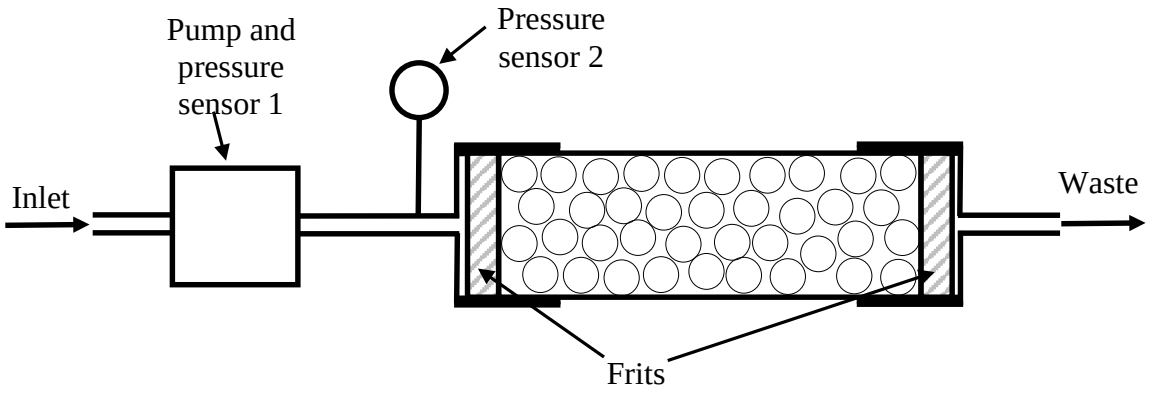
Supporting Information

SI Figure 1. SEM image of the FC10 calcium carbonate powder used here (scale bar represents a length of 2 μm) and key properties of the powder and packed columns containing it. The average particle radius corresponds to the average of the radii at 50% of the cumulative distribution from sieving analysis and the mean radii derived from SEM images.

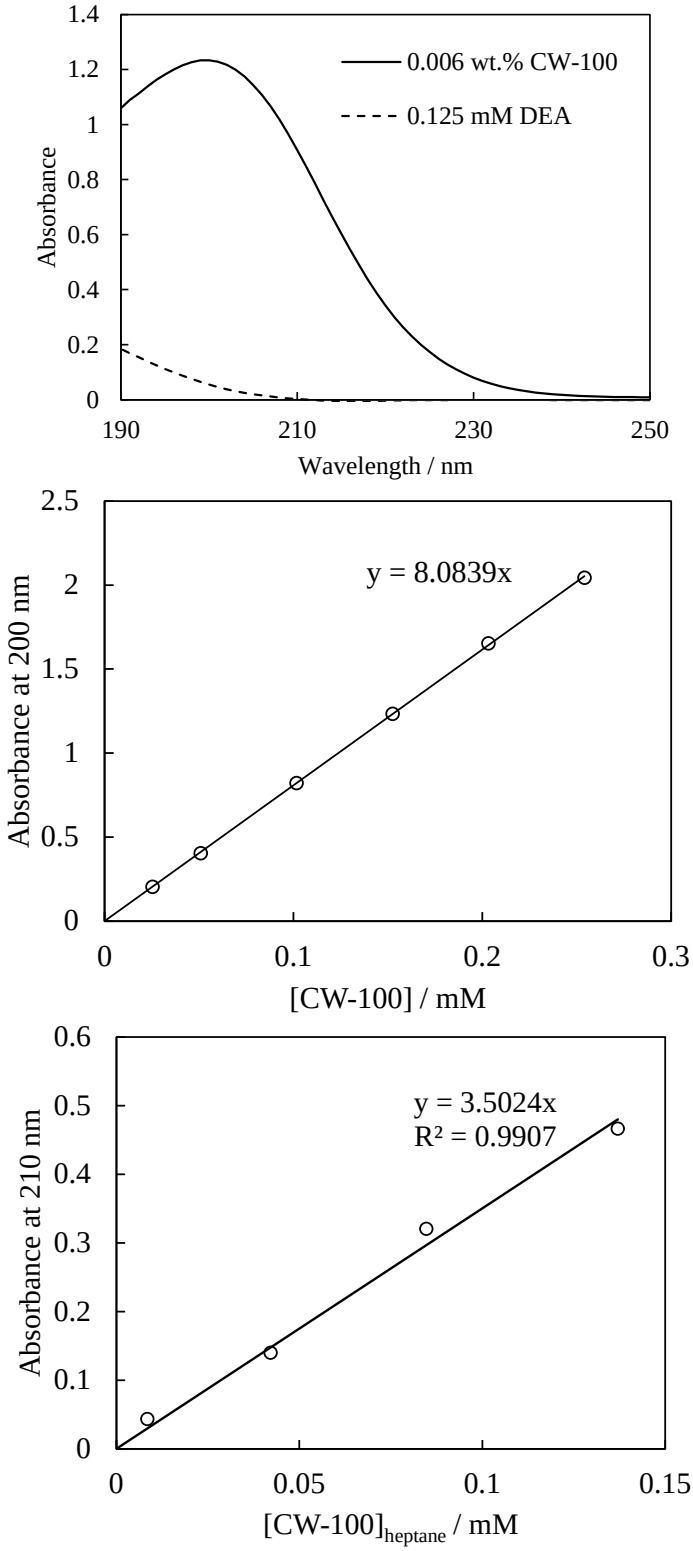


Powder	Average particle radius /μm	specific surface area /m^2 g^{-1}	Powder particle internal pore volume fraction	Powder particle internal pore radius/nm	Packed column pore volume fraction ϕ_{pore}	Average effective pore radius r_{pore}/μm
FC10	1.4	8.6	0.08	110	0.45	0.16

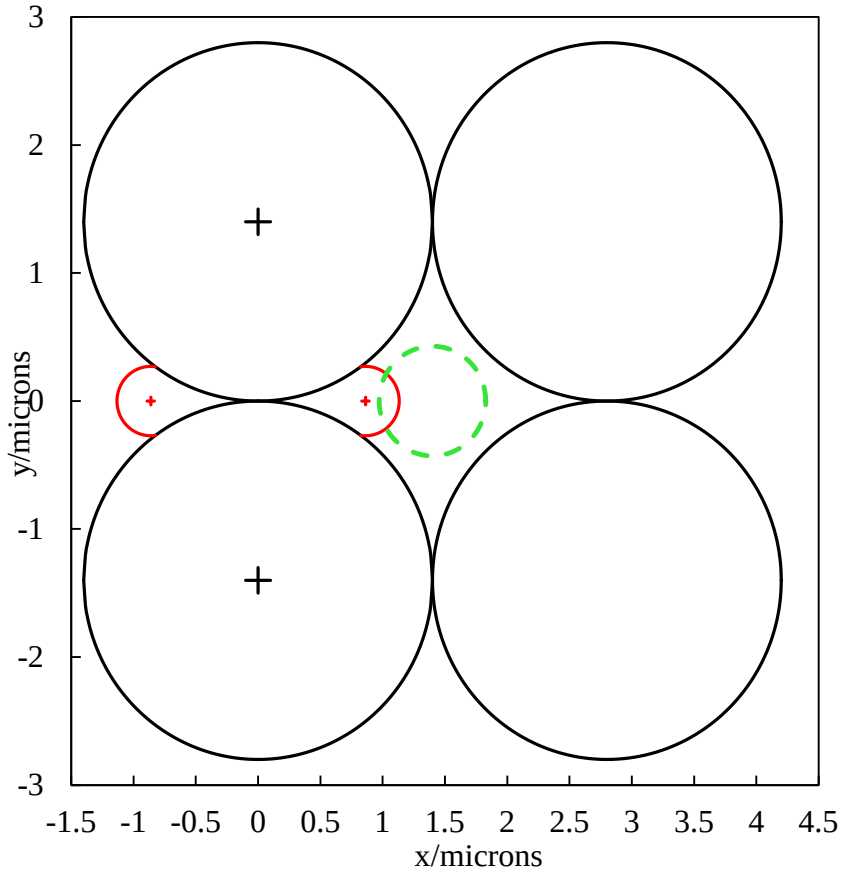
SI Figure 2. Schematic of the packed powder column flood setup.



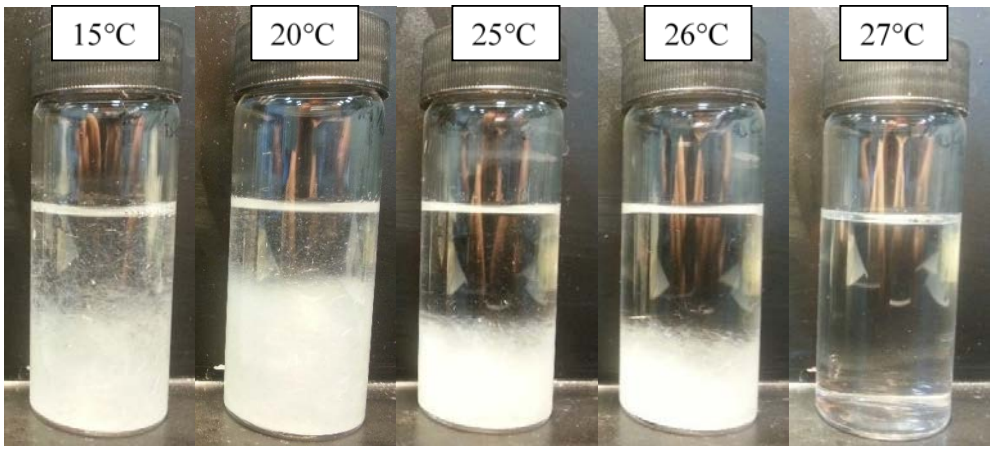
SI Figure 3. UV spectra (10 mm path length, versus solvent as reference) of 0.006 wt.% CW-100 (containing 0.15 mM surfactant plus 0.11 mM DEA) and 0.125 mM pure DEA in water (upper plot). Calibration plots for CW-100 in water (middle plot) and heptane (lower plot).

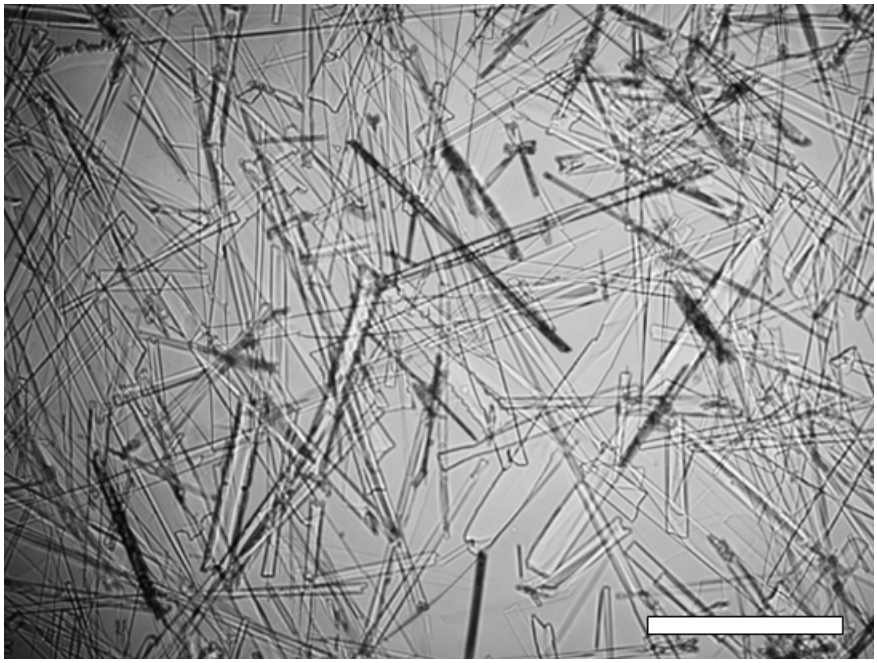


SI Figure 4. Geometry of cubic close packed calcite particles (black), oil liquid bridge with θ = 28° (red) and resultant calculated water flow channel (green).



SI Figure 5. Solutions of 10 mM C14BDMAC in water containing 150 mM NaCl and 10 mM Na_2CO_3. The samples were left at 15 °C for 1 hour, then the temperature increased to the values shown for 30 minutes (upper image). The lower image shows an optical micrograph of the crystals formed from the precipitation of C14BDMAC from an aqueous solution of 5 mM C14BDMAC, 150 mM NaCl and 10 mM Na_2CO_3 left at room temperature (approximately 22 °C) for 12 hours. The scale bar represents 500 μm.





SI Figure 6. Solution-air surface tension versus surfactant concentration for C14BDMAC/ water with 10 mM Na_2CO_3 + 150 mM NaCl (upper plot) and CW100/water (lower plot). The horizontal dotted lines correspond to the tension in the absence of surfactant. The dashed lines are guides for the eye indicating the break points in the plots. For the C14BDMAC system, the cmc (or solubility limit) = 0.065 mM. For the CW-100 system, there are two break points at 0.0063 and 0.033 mM