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以油酸为原料的新型生物基支链十七烷基苯磺酸钠的合成及性质

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Synthesis and Properties of a Novel Bio-Based Branched Heptadecylbenzene Sulfonate Derived from Oleic Acid

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1. The condition of GC-MS analyzation

The gas chromatograph was equipped with a capillary column HP-5MS (30 m × 0.25 mm), which film thickness was 0.25 μm. The source temperature and the injector temperature were 230 and 250 ℃, respectively. The temperature was programmed from 50 ℃ (2 min) to 230 ℃ at 40 ℃·min^{-1} and then to 250 ℃ at 10 ℃·min^{-1} and then to 280 ℃ at 20 ℃·min^{-1} (keeping this temperature for 10 min). With split ratio 50:1, 0.20 μL of sample was injected. Sulfuric acid and methanol solution (1:9 in volume) was applied as esterification reagent for the derivatization of oleic acid, stearic acid, phenyl stearic acid.

2. The component of Daqing oil field simulated formation water

Daqing oil field simulated formation water consists of 112.9 mg·L^{-1} $CaCl_2$, 43.6 mg·L^{-1} $MgCl_2$, 1582.0 mg·L^{-1} NaCl, 17.0 mg·L^{-1} Na_2SO_4, 381.6 mg·L^{-1} Na_2CO_3 and 3175.2 mg·L^{-1} $NaHCO_3$. The total dissolved substance is 5312.3 mg·L^{-1}.

3. The yield calculation of alkylation, decarboxylation, sulphonation and neutralization

The conversion of alkylation was calculated by a formula

$$\eta = \frac{A_R \times A'_I - A'_R \times A_I}{A_R \times A'_I}$$

where A_R is the peak area of methyl oleate before the alkylation; A'_R is the peak area of methyl oleate after the alkylation; A_I is the peak area of methyl stearate before the alkylation; A'_I is the peak area of methyl stearate after the alkylation.

The conversion of decarboxylation was calculated as the ratio of the peak area for product and the sum peak area for both reactant and product after decarboxylation.

The conversion of sulphonation and neutralization was computed as the mole ratio of product and reactant by weighing method using a formula.

$$\eta = \frac{316 \times m_B}{418 \times m_A}$$

where, m_A and m_B are the weight of the reactant and product, respectively; 316 is the molecular weight of reactant; 418 is the molecular weight of product.

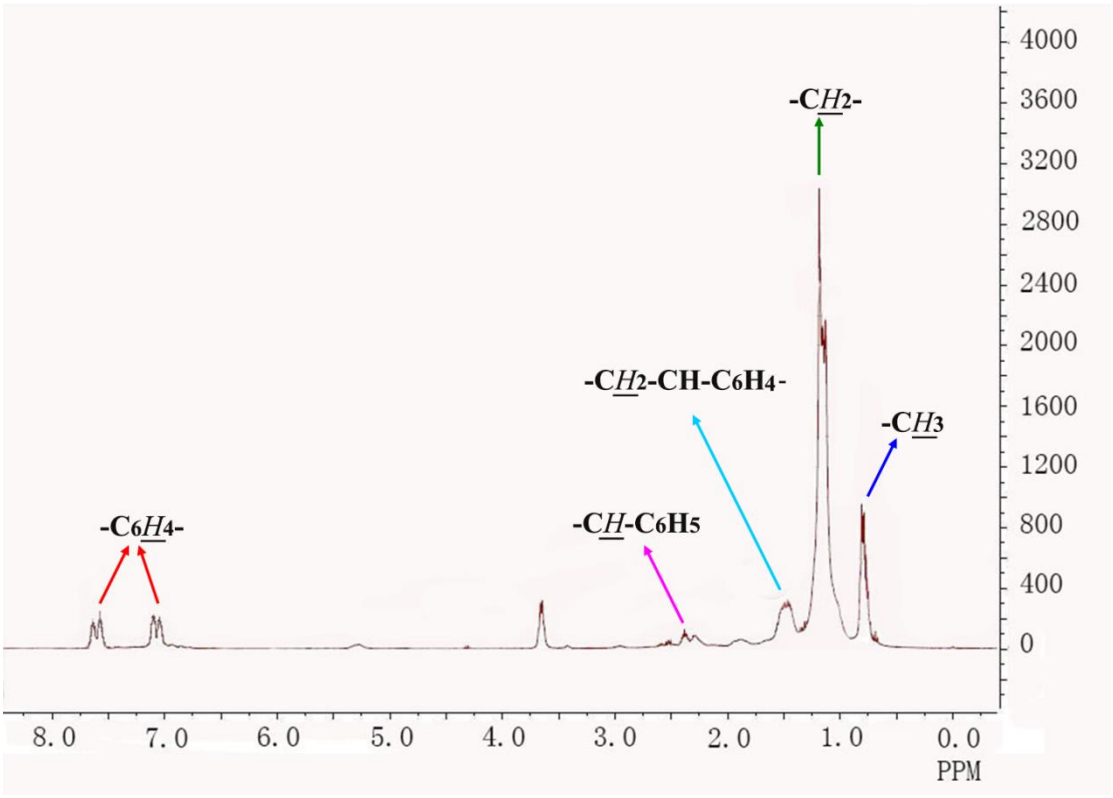

Fig.S1 H NMR spectrum of 9ΦC17S

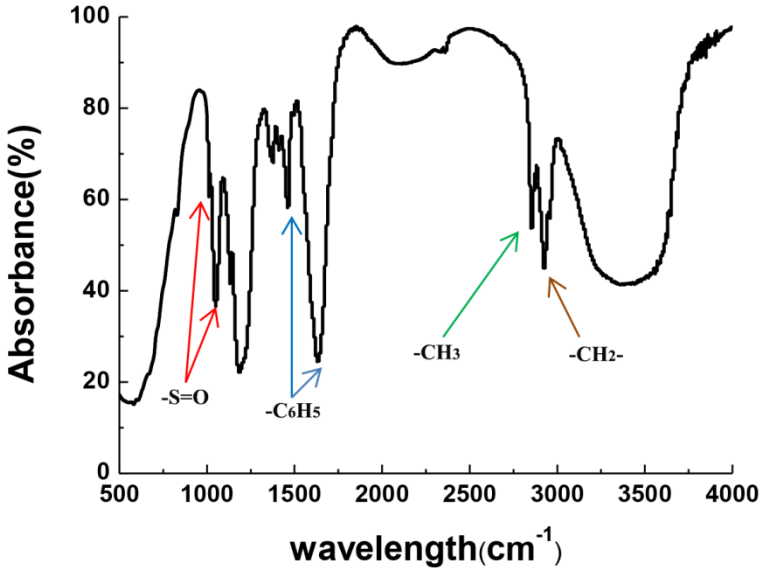

Fig.S2 Infrared spectroscopy of 9ΦC17S

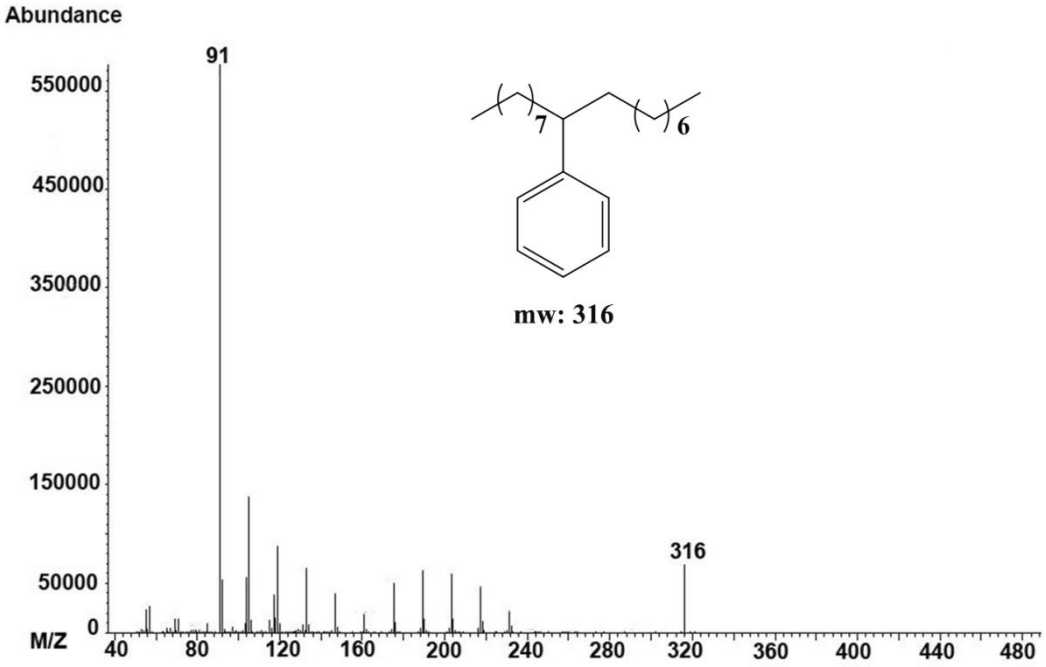

Fig.S3 Mass spectrum of heptadecylbenzene

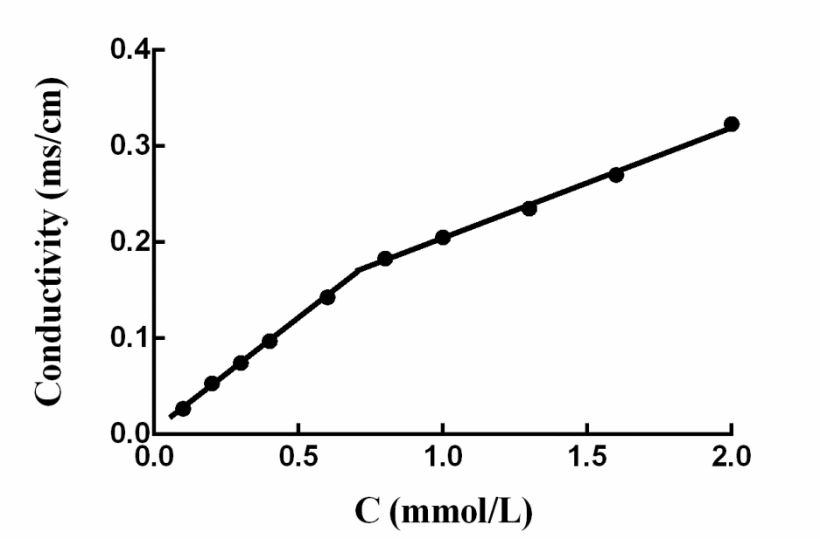

Fig.S4 Variation of the conductivity of 9ΦC17S solution with concentrations at 25 ℃

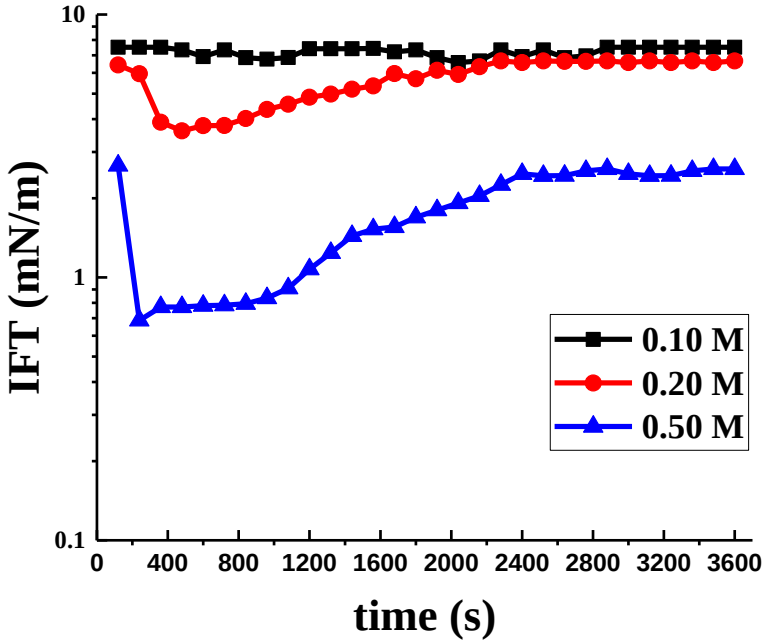

Fig.S5 Dynamic interfacial tensions between Daqing crude oil and different concentrations Na_2CO_3 solutions in simulated formation water at 50.0 ℃

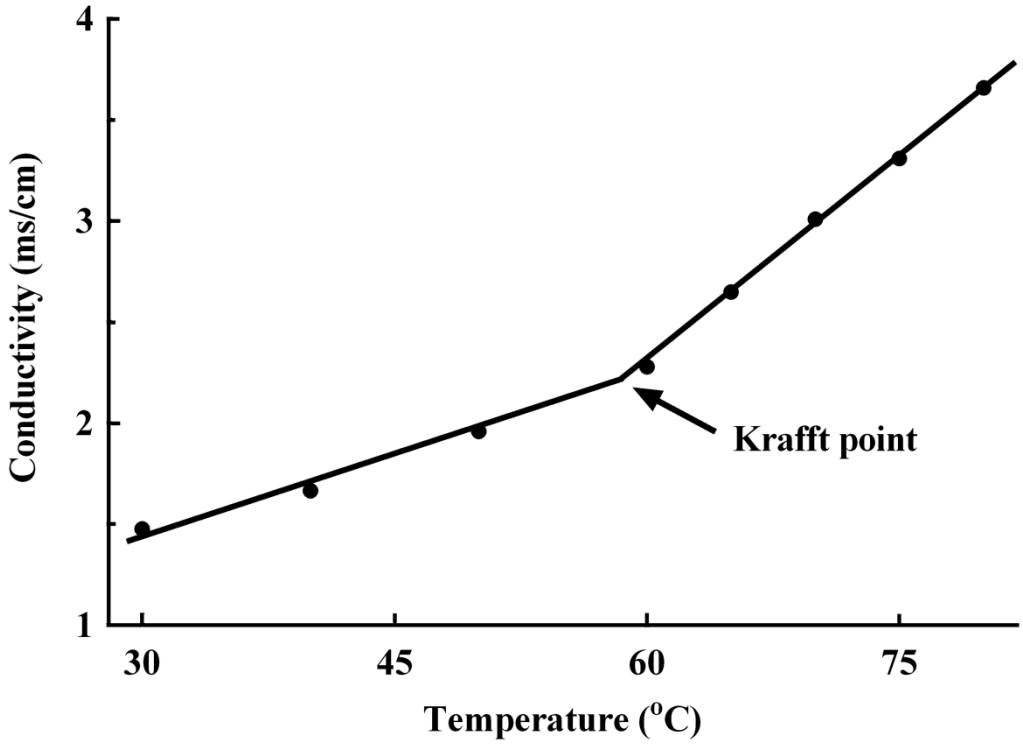

Fig.S6 Krafft point of 9ΦC17S

Variation of the conductivity of 1% 9ΦC17S solution with the temperatures