Supporting Information

Properties and Sodium Salicylate Induced Aggregation Behaviors of Tail-branched Cationic Surfactant With a Hydroxyl-containing Hydrophilic Head

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Preparation of catalyst (I) for Guerbet reaction:

A mixed solution of copper nitrate (12.7g), magnesium nitrate (15.3g), nickel nitrate (1.3g), lanthanum nitrate (0.7g), as well as a solution of sodium carbonate was prepared to be 10wt% and 5wt% respectively. The mixed nitrate solution and sodium carbonate solution were added dropwise simultaneously into a suspension of $CaCO_3$ (10wt%) which contained 9.4g $CaCO_3$, and the process of addition was operated at 45^oC and finished in 40min. The addition rate of nitrate solution and sodium carbonate was controlled to keep the pH at 6. After the addition of mixed nitrate solution, the mixed system was kept stirring for another 4h at pH9, which was then filtered and dried. The final step was to calcine the precipitate at 450^oC for 3h to obtain the catalyst (I) composed of metal oxides. The catalyst was grinded into powder before catalyzing the Guerbet reaction.

Synthesis of Guerbet-cetyl alcohol:

The raw material n-octanol (130g) was mixed with 0.5g catalyst (I) and 2.0g KOH in the reactor and heated up to 240^oC under stirring. The reaction was kept at about 240^oC for 1h while N_2 (0.3L/min) was fed into the system during the entire reacting process. The reaction product was filtered to remove solid catalyst out and then distilled to obtain purified 2-hexyl-1-decanol.

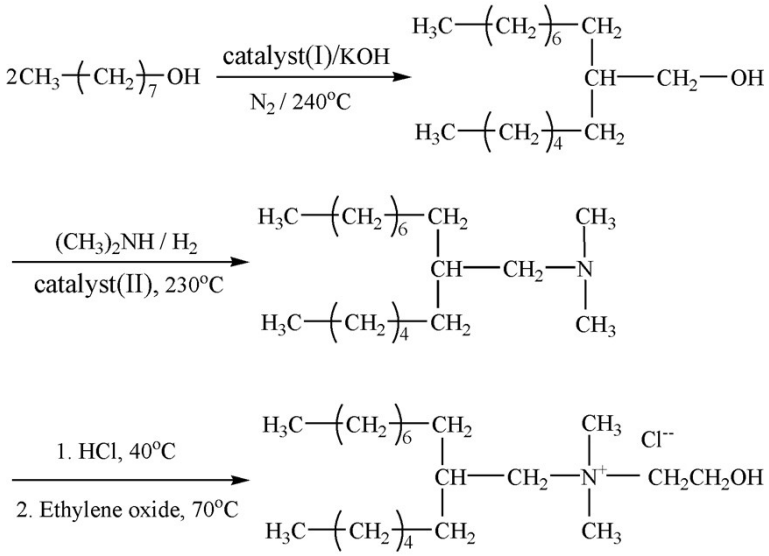
Preparation of catalyst (II) for amination:

The catalyst (II) was prepared by similar procedures as catalyst (I), while magnesium and lanthanum was not incorporated into the catalyst (II) and the molar ratio of Cu/Ni was manipulated to be 32:1.

Synthesis of Guerbet-cetyl dimethyl amine:

The mixture of Guerbet-cetyl alcohol and catalyst (II) was heated up to 170-180^oC during which the H_2 (0.4L/min) was fed into the reaction system to reduce the catalyst for 40min under stirring. After the reduction of catalyst, the reactor was heated up to 230^oC at which the reaction was operated for

3h with constant injection of dimethylamine gas (0.6L/min) and hydrogen gas (0.4L/min) into the Guerbet-cetyl alcohol/catalyst mixed system. The reaction product was filtered to get rid of solid catalyst and further distilled to obtain purified intermediate tertiary amine.



Scheme S1. Synthetic route of Guerbet-cetyl dimethyl hydroxyethyl ammonium chloride (G-CDHAC)

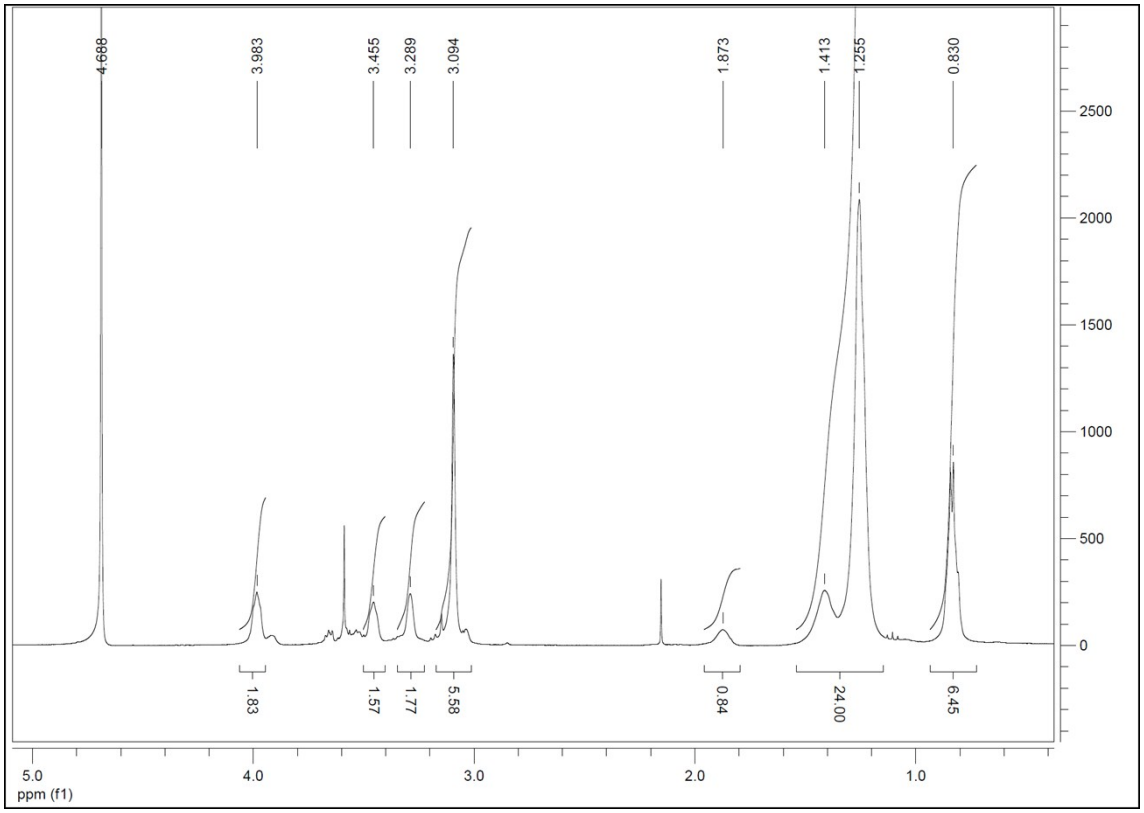


Figure S1. ^{1}HNMR (D_2O) spectrum of G-CDHAC

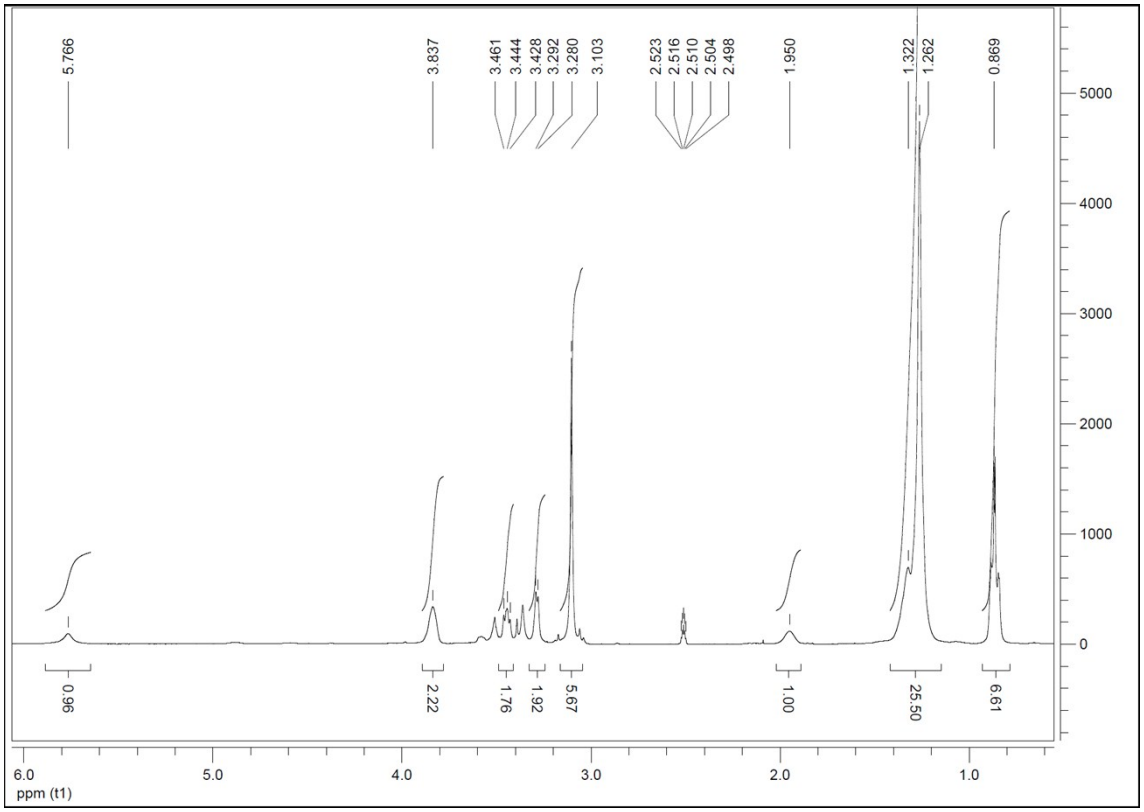


Figure S2. ^{1}HNMR(DMSO-d6) spectrum of G-CDHAC

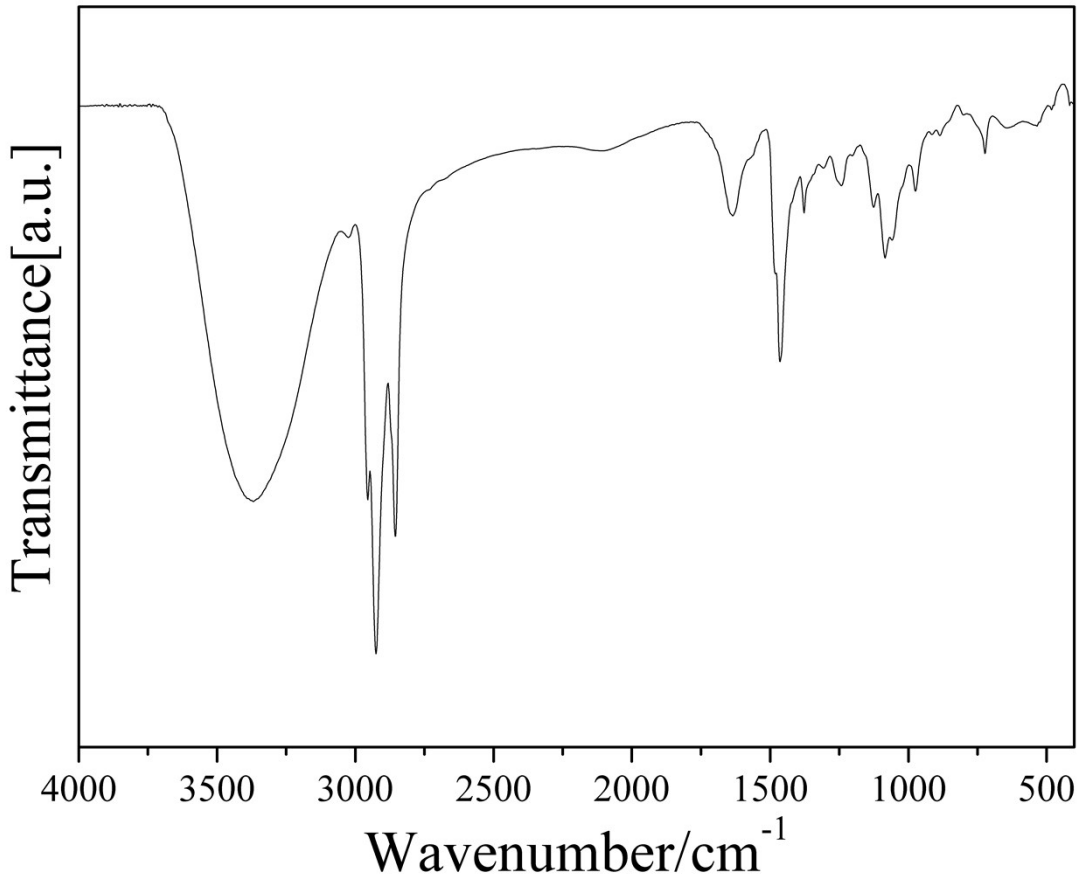


Figure S3. FT-IR spectrum of G-CDHAC