Supporting Information

Novel Rosin-based Hydrophobically Modified Cationic Polyacrylamide for Kaolin Suspension Flocculation

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Preparation of DMDHAE

Dehydroabietyl chloride (DHA-Cl) was prepared by DHA (12.0 g, 0.04 mol) with excess oxalyl chloride (5.33 g, 0.042 mol) in dichloromethane (40 mL) at ambient temperature for 4 h. DHA-Cl was obtained after evaporation of the solvent and excess oxalyl chloride. DHA-Cl (0.04 mol), triethylamine (4.04 g) and 3-bromopropan-1-ol (5.84 g, 0.042 mol) were dissolved in tetrahydrofurane (40 mL), and then the solution was heated at 55 ^{o}C for 8h. After the reaction, the organic phase was filtrated and washed with dilute hydrochloric acid (three times), saturated Na_2CO_3 aqueous solution (three times), and subsequently dried with anhydrous sodium sulfate. After evaporation of the solution, dehydroabietic acid-3-bromopropyl ester (DHAE, 11.65 g) was obtained. DHAE (8.0 g, 0.019 mol), methyldiallylamine (2.109 g, 0.019 mol) and ethanol (40 mL) were added in flask at 65 ^{o}C for 48h. After the reaction, ethanol was removed in a rotary evaporator, and then the crude product was recrystallized from Ethyl acetate to obtain the pure DMDHAE. The synthesis route of DMDHAE was shown in Fig. s1. ^{1}H NMR (300 MHz, DMSO) δ 7.18 (d, 1H), 6.98 (dd, 1H), 6.86 (d, 1H), 6.16 – 5.90 (m, 2H), 5.73 – 5.40 (m, 4H), 4.16 – 3.87 (m, 6H), 3.23 (dd, 2H), 3.02 – 2.63 (m, 6H), 2.40 – 1.50 (m, 9H), 1.40 – 1.01 (m, 14H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 177.54 (O=C-O), 146.21 (Ar), 145.43 (Ar), 123.53 (Ar), 133.74 (Ar), 129.53 (C=C), 126.33 (Ar), 123.53 (C=C), 123.48 (Ar), 63.34 (C-N), 60.59 (C-O), 57.34 (s), 47.53 (s), 47.21 (s), 44.51 (s), 37.55 (s), 36.40 (d, J = 2.9 Hz), 32.93 (s), 29.46 (s), 24.44 (s), 23.45 (s), 22.09 (s), 21.26 (s), 17.95 (s), 16.01 (s). ESI-MS (see Fig.s4, m/z 452.5 theoretical m/z: 452.5+79(Br)).

Characterization

Nuclear magnetic resonance (NMR) spectra of DMDHAE were recorded with a 300 MHz spectrometer (Bruker Company, Germany) at room temperature with dimethyl sulfoxide-d6

(DMSO-d_6) or deuterated chloroform ($CDCl_3$). Mass spectrum was recorded on an Agilent-5973 spectrometer (ESI source; Agilent Technologies, USA).

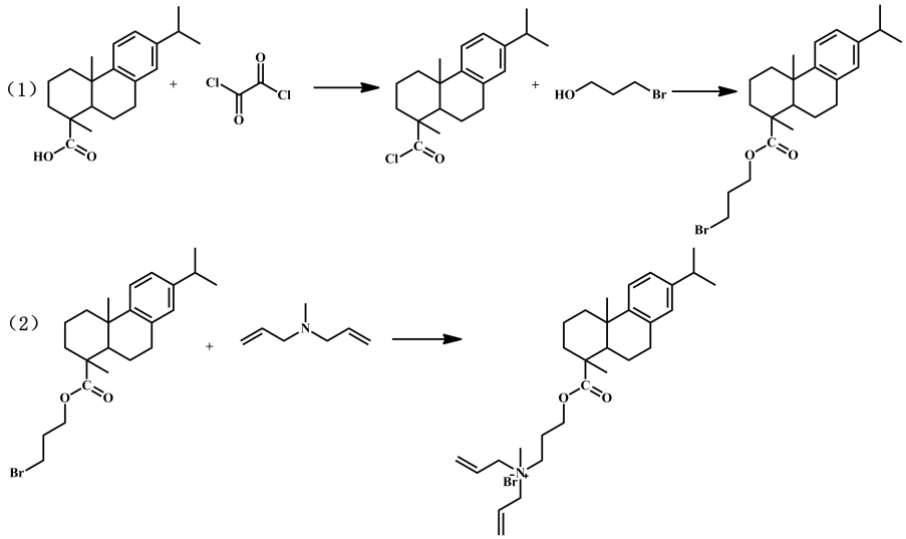


Fig. s1 Schematic for synthesis of DMDHAE

NMR analysis of DMDHAE

The ^{1}H NMR spectra of DMDHAE and DHAE were depicted in Fig.s2. As shown in the spectrum of DHAE, chemical shift at 6.7 – 7.3 ppm were assigned to protons of aromatic ring. The peaks at 3.9 – 4.3 ppm were attributed to the protons of -OCH_2. The protons of –CH_2Br were observed at 3.45 – 3.65 ppm. Compared with the spectrum of DHAE, the protons of –CH=CH_2 were obviously appeared at 5.4 – 6.2 ppm in the spectrum of DMDHAE. As shown in Fig.s3, the characteristic peaks of carboxyl groups and C=C group were presented at 177.5 ppm, 130.57 ppm and 127.69 ppm, respectively. These results indicated that the DMDHAE was successfully synthesized.

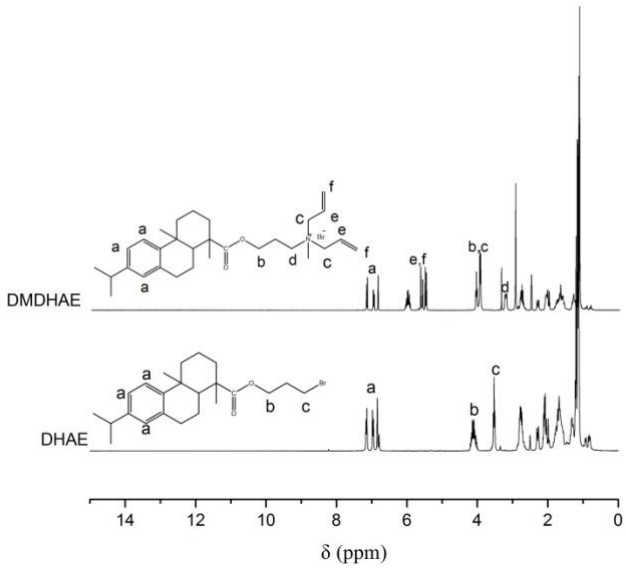


Fig. s2 ^{1}H NMR spectra of DMDHAE and DHAE

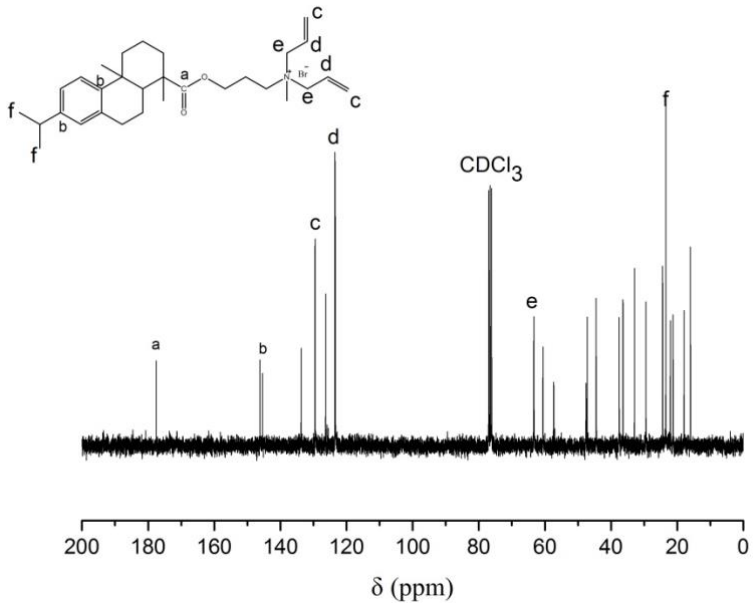


Fig. s3 ^{13}C NMR spectrum of DMDHAE

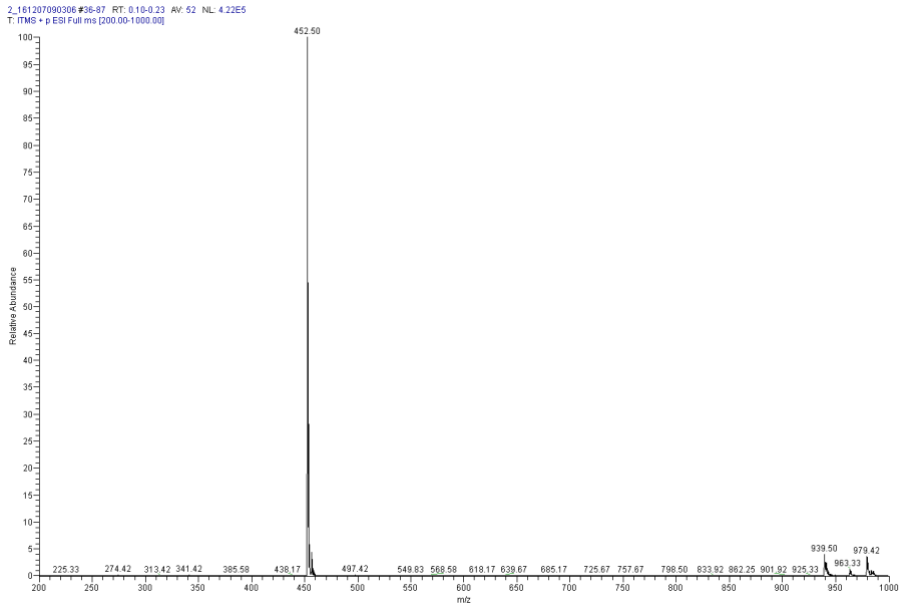
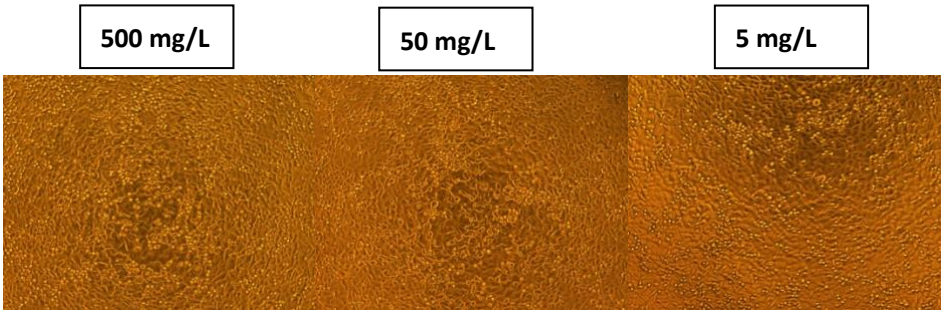


Fig. s4 Mass spectra of DMDHAE



CPAM

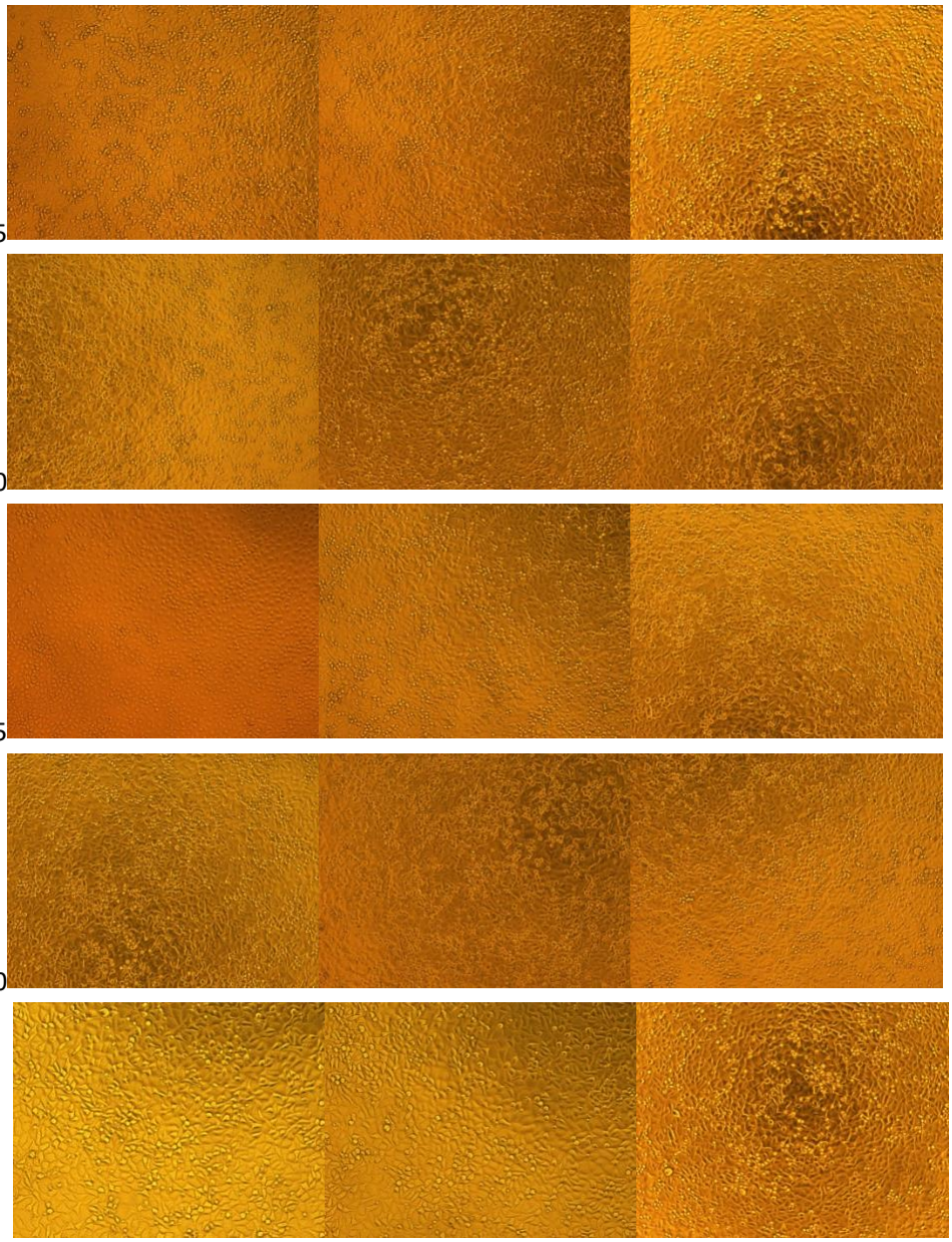


Fig.s5 cell images