Supporting Information

A Water-soluble Antimicrobial Acrylamide Copolymer Containing Sulfitobetaine for Enhanced Oil Recovery

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Optimum of copolymerization conditions

The effect of pH on copolymerization was first investigated as shown inTable I (entries 1-5). It was found that the apparent viscosity of the copolymer could not be improved when the pH was increased or decreased (Table I, Entries 1, 2, 4 and 5). The best result was obtained when the pH value was 8 (Table I, Entry 3).

The initiator concentration was equally important factor for copolymerization (Table I, Entries 3 and 6-9). The best loading of initiator was 0.2 wt% (Table I, Entry 3). As the initiator concentration was increased or decreased, the higher apparent viscosity of copolymer could not be obtained (Table I, Entries 6-9).

And then, the effect of temperature on copolymerization was studied (Table I, Entries 10-13). We found that the best result was obtained when the temperature was changed to 35 ^{o}C (Table

I, Entry 11). However, the copolymer showed poor results at both low and high temperature (Table I, Entries 3, 10, 12 and 13).

The ratio of AM to AA had an important influence on the properties of copolymer. We also investigated the effect of AM-to-AA ratio on the apparent viscosity of the copolymer. The result was shown in Table II (Entries 1-5). It could be seen that the apparent viscosity of the polymer first increased and then decreased with the ratio of AM to AA increasing, and it came to a head when the ratio was 1.00 (wt) (Table II, Entry 3).

The addition of zwitterionic monomer (ADMES) could improve the properties of the copolymer. Therefore, the loading of ADMES was investigated (Table II, Entries 3 and 6-9). It could be noted that the best loading of ADMES was 2 wt% (Table II, Entry 6).

Table S1 Effect of the pH, Temperature and Initiator Concentration

Entry[a]	pH	Initiator (wt%)	Temperature (°C)	Apparent Viscosity (mPa·s)[b]	Conversion (%)[c]
1	6	0.2	40	132.0	90
2	7	0.2	40	337.7	92
3	8	0.2	40	357.8	90
4	9	0.2	40	282.0	68
5	10	0.2	40	201.9	49
6	8	0.1	40	309.5	84
7	8	0.3	40	313.8	91
8	8	0.4	40	262.1	93
9	8	0.5	40	125.7	95
10	8	0.2	30	250.5	90
11	8	0.2	35	380.9	93
12	8	0.2	45	312.0	95
13	8	0.2	50	267.8	94

[a]Condition: *m*(AM): *m*(AA): *m*(ADMES) = 70 : 29 : 1 (wt%), Concentration = 20 wt%, and reaction time=8 h.

[b]Apparent viscosity: concentration of copolymer solution = 0.2 wt%, tested by Brookfield DV-Ⅲ Programmable Rheometer with a 62# rotor at 30 °C.

[c]Conversion: AM, tested by HPLC using ODS column in a UV detector (210 nm), H_2O/CH_3OH=90/10 (vol/vol)

Table S2 Effect of The Monomers Ratio

Entry[a]	AM (wt%)	AA (wt%)	ADMES (wt%)	Apparent Viscosity (mPa·s)[b]	Conversion (%)[c]
1	70	29	1	380.9	85
2	60	39	1	417.9	89
3	50	49	1	468.0	94
4	40	59	1	435.7	93
5	30	69	1	342.1	91
6	50	48	2	546.5	95
7	50	47	3	438.8	88
8	50	46	4	392	85
9	50	45	5	310.3	79

[a]Condition: pH = 8, Temperature = 35 °C, Initiator ($NaHSO_3$-$(NH_4)_2S_2O_8$) = 0.2 (wt%), Concentration of monomers = 20 (wt%), reaction time=8 h.

[b]Apparent viscosity: concentration of copolymer solution = 0.2 wt%, tested by Brookfield DV-Ⅲ Programmable Rheometer with a 62# rotor at 30 °C.

[c]Conversion: AM, tested by HPLC using ODS column in a UV detector (210 nm), H_2O/CH_3OH=90/10 (vol/vol)

Intrinsic viscosity of copolymer

The intrinsic viscosity ($[\eta]$) is a measurement of the hydrodynamic volume of macromolecules, which reflects the expanded extent of the polymer chain and shows the effect of macromolecules on liquidity of solvent in solution.[1,2] The test result of $[\eta]$ of copolymer AM/AA/ADMES was shown in Fig. S1. According to the relationship curve between η_{sp}/C and concentration, the intrinsic viscosity ($[\eta]$) could be obtained via extrapolating the curve in landscape orientation. It was clear to see from the Fig. S1 that the intrinsic viscosity ($[\eta]$) of copolymer AM/AA/ADMES was 1162 mL/g.

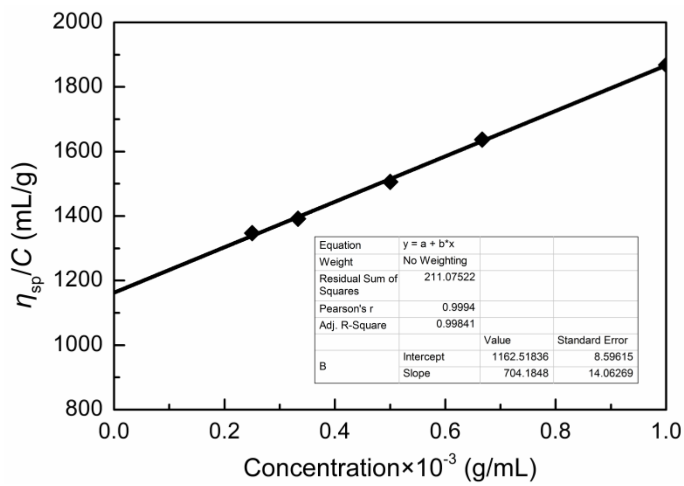

Fig. S1. The relationship between η_{sp}/C and concentration of AM/AA/ADMES

References

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