Supporting Information

Effect of Base oil Polarity on the Functional Mechanism of Viscosity Modifier: Unravelling the Conundrum of Coil Expansion Model

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Dynamic light scattering (DLS) analysis of dilute PBMA solution

Figure S1 shows the hydrodynamic diameter of the VM polymer in base oils of different compositions and at various temperatures measured using DLS technique. The polymer particles typically exhibited a bimodal size distribution, with smaller particles in the range of 20 nm and bigger particles in the order of a few hundred nanometers. The size of the smaller particles did not vary much with the change in solvent composition and/or temperature. While the smaller particles likely correspond to discrete polymer coils, the larger particles could be either polymer aggregates or some other high-molecular weight entities present in the polymer sample. In pure DGDE and 80:20 DGDE/SQ mixture, these large particles are present at all the measurement temperatures; whereas in 70:30 and 60:40 DGDE/SQ mixture, these particles are present only at the higher temperatures.

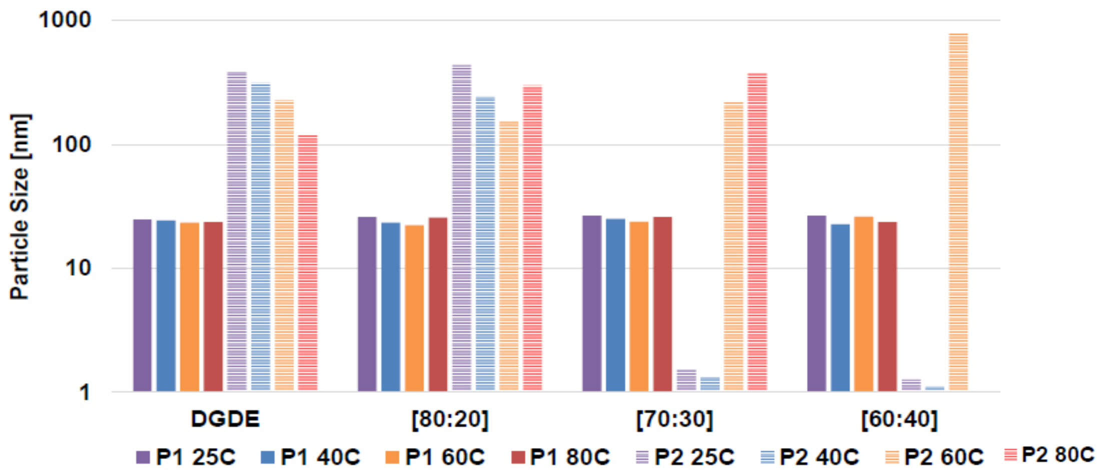
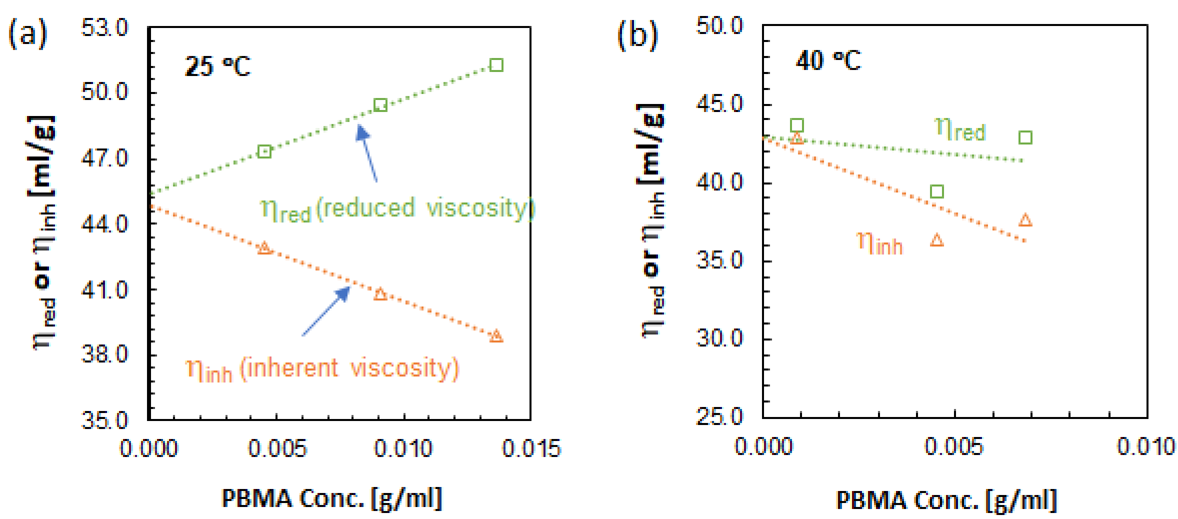
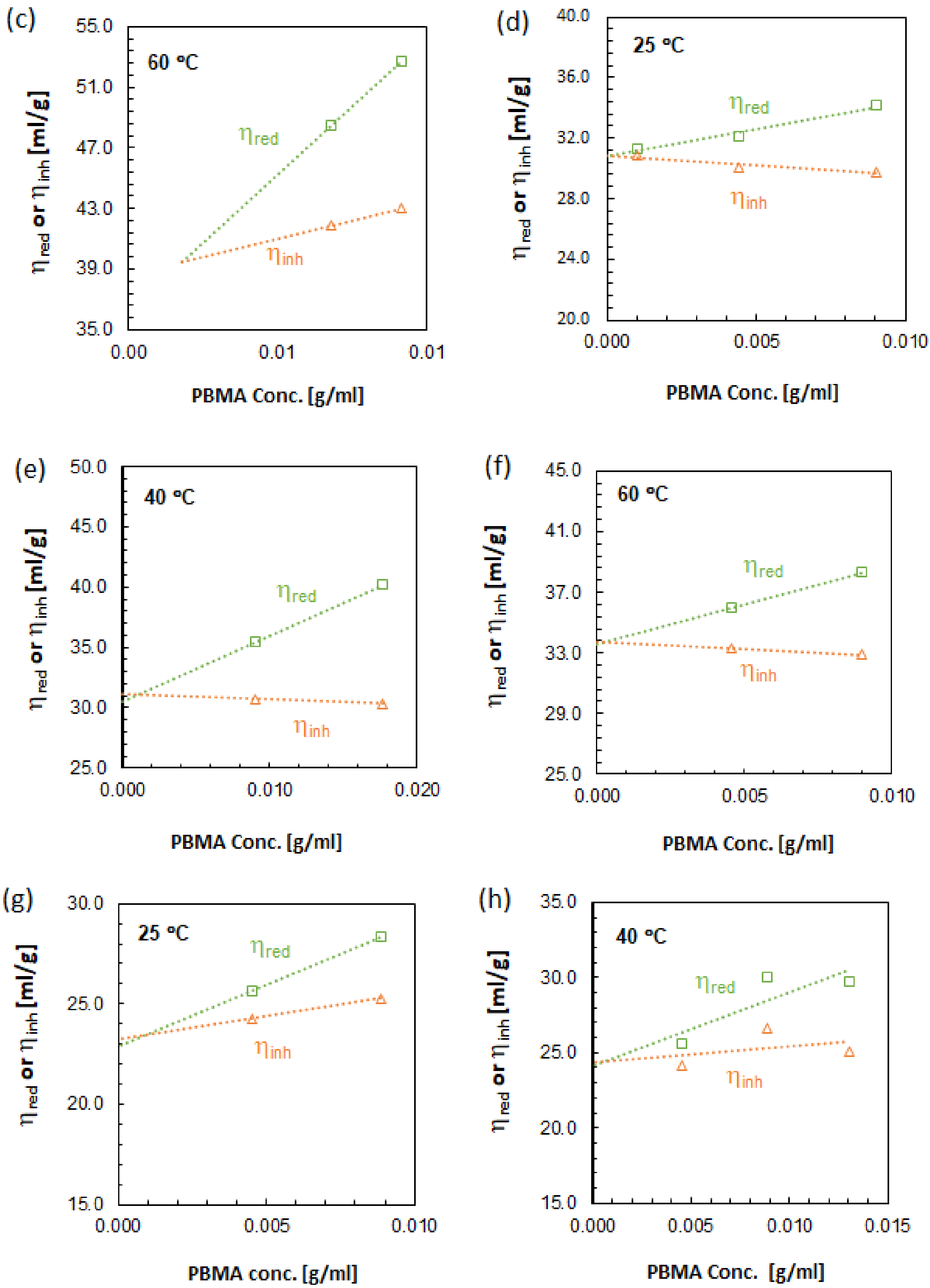


Figure S1. PBMA coil size in different base oil compositions and at various temperatures. P1 refers to discrete polymer particles and P2 refers to either polymer clusters or high-molecular weight entities present in the polymer sample.

Huggins-Kraemer plots for determination of intrinsic viscosity




(c)
60 °C
ηred
ηinh
55.0
51.0
47.0
43.0
39.0
35.0
0.00
0.01
0.01
ηred or ηinh [ml/g]
PBMA Conc. [g/ml]
(d)
25 °C
ηred
ηinh
40.0
36.0
32.0
28.0
24.0
20.0
0.000
0.005
0.010
ηred or ηinh [ml/g]
PBMA Conc. [g/ml]
(e)
40 °C
ηred
ηinh
50.0
45.0
40.0
35.0
30.0
25.0
0.000
0.010
0.020
ηred or ηinh [ml/g]
PBMA Conc. [g/ml]
(f)
60 °C
ηred
ηinh
45.0
41.0
37.0
33.0
29.0
25.0
0.000
0.005
0.010
ηred or ηinh [ml/g]
PBMA Conc. [g/ml]
(g)
25 °C
ηred
ηinh
30.0
25.0
20.0
15.0
0.000
0.005
0.010
ηred or ηinh [ml/g]
PBMA conc. [g/ml]
(h)
40 °C
ηred
ηinh
35.0
30.0
25.0
20.0
15.0
0.000
0.005
0.010
0.015
ηred or ηinh [ml/g]
PBMA Conc. [g/ml]

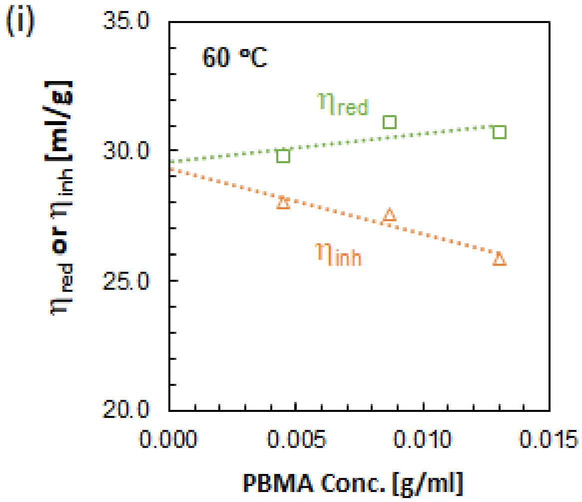
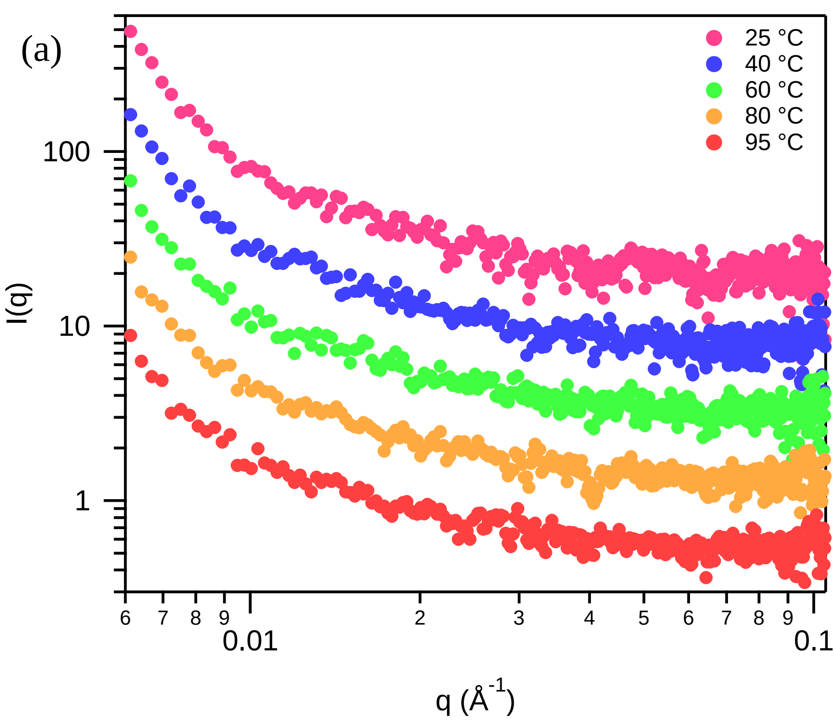
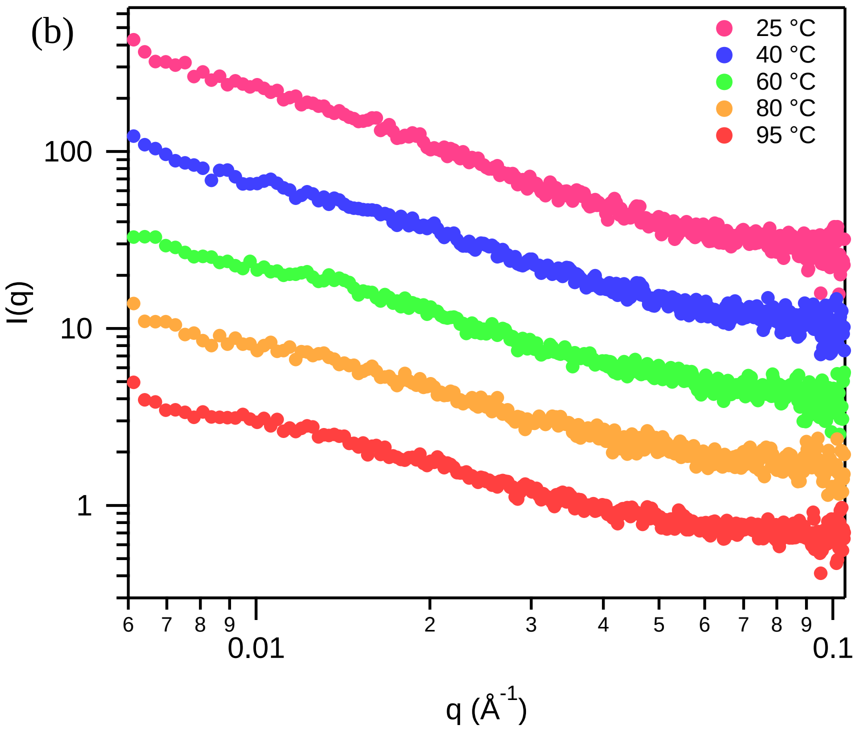
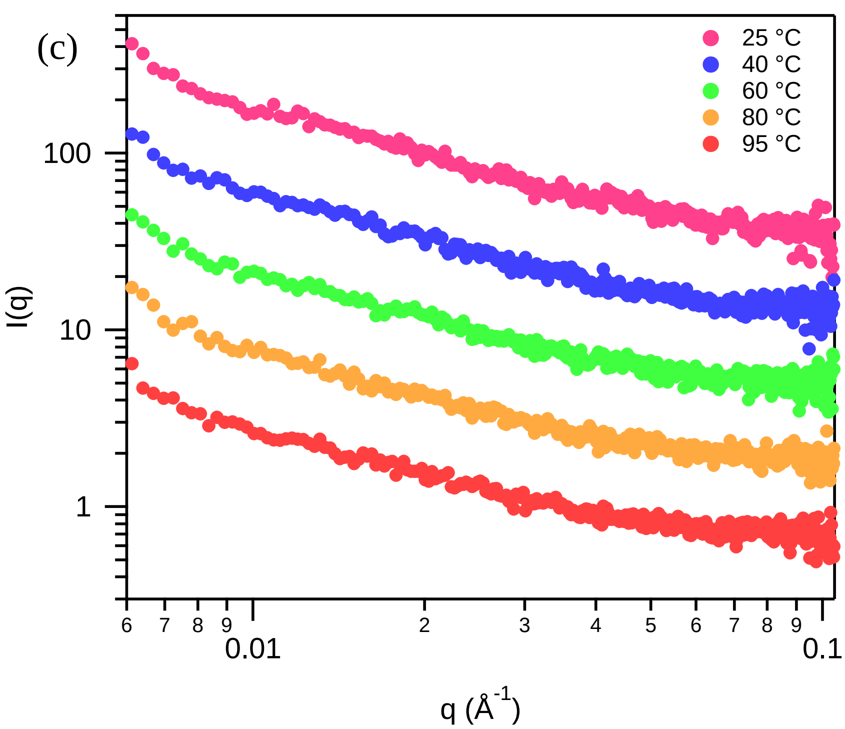


Figure S2. Huggins-Kraemer plots for PBMA in: (a)–(c) pure DGDE, (d)–(f) 70:30 DGDE/SQ mixture, (g)–(i) 60:40 DGDE/SQ mixture. η_{red} and η_{inh} refer to reduced and inherent viscosities, respectively.

Temperature resolved SAXS profiles of PBMA solutions in different solvent compositions.




(b)
25 °C
40 °C
60 °C
80 °C
95 °C
I(q)
100
10
1
6
7
8
9
0.01
2
3
4
5
6
7
8
9
0.1
q (Å^{-1})


(c)
25 °C
40 °C
60 °C
80 °C
95 °C
I(q)
100
10
1
6
7
8
9
0.01
2
3
4
5
6
7
8
9
0.1
q (Å^{-1})

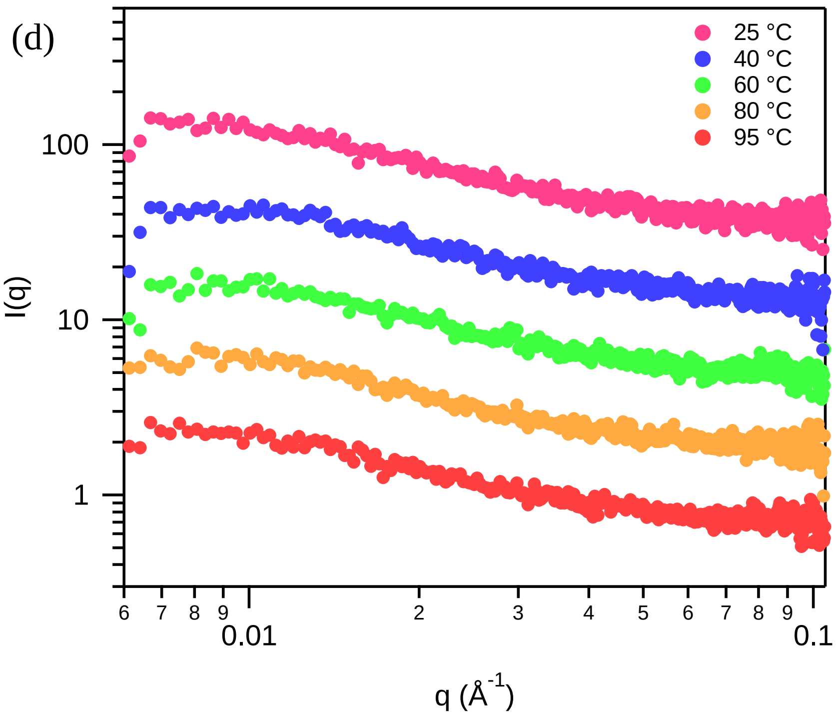


Figure S3. SAXS profiles of PBMA solutions as a function of temperature in: (a) pure DGDE, (b) 60:40 DGDE/SQ, (c) 70:30 DGDE/SQ, (d) 80:20 DGDE/SQ mixture. The intensity data shown in the graph are vertically shifted for clarity.