

Supporting Information

Understanding the Temperature-resistance Performance of Borate Cross-linked Hydroxypropyl Guar Gum Fracturing Fluid Based on a Facile Evaluation Method

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1. Effect of HPG concentration on the temperature resistance performance of HPG/Na₂B₄O₇ fracturing fluid

1.1 0.2wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9

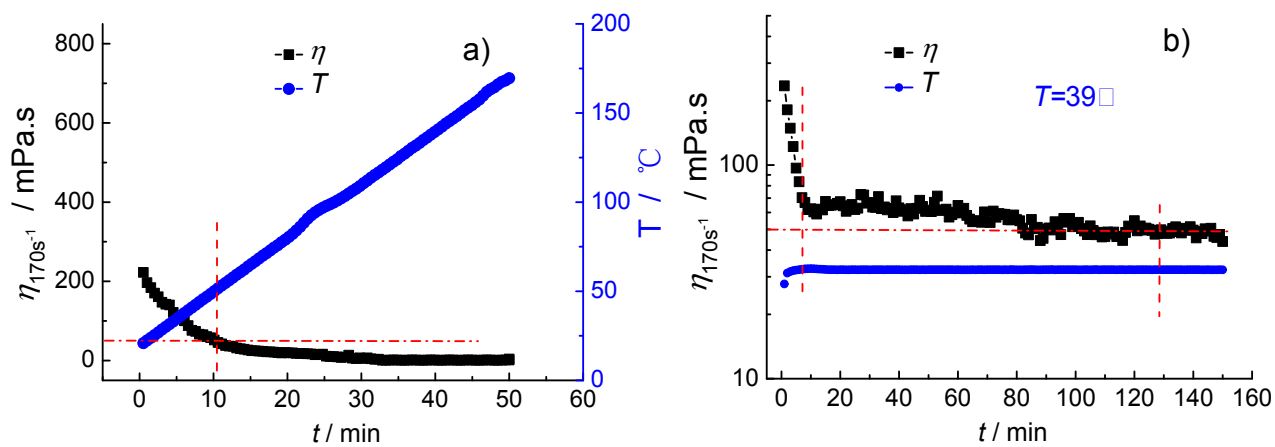


Fig.S1 The viscosity-temperature curve(a) and viscosity-time curve of the fracturing fluid at different temperature(b). The fracturing fluid is prepared by 0.2wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9.

Tab.S1 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.2wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9.

Parameters		Experimental results
$T_{\max}$		51.1 $^{\circ}C$
$t(T)$	$T=39^{\circ}C$	120 min
$T_{\max}(\eta_0, t_0)$		39 $^{\circ}C$

1.2 0.4wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9

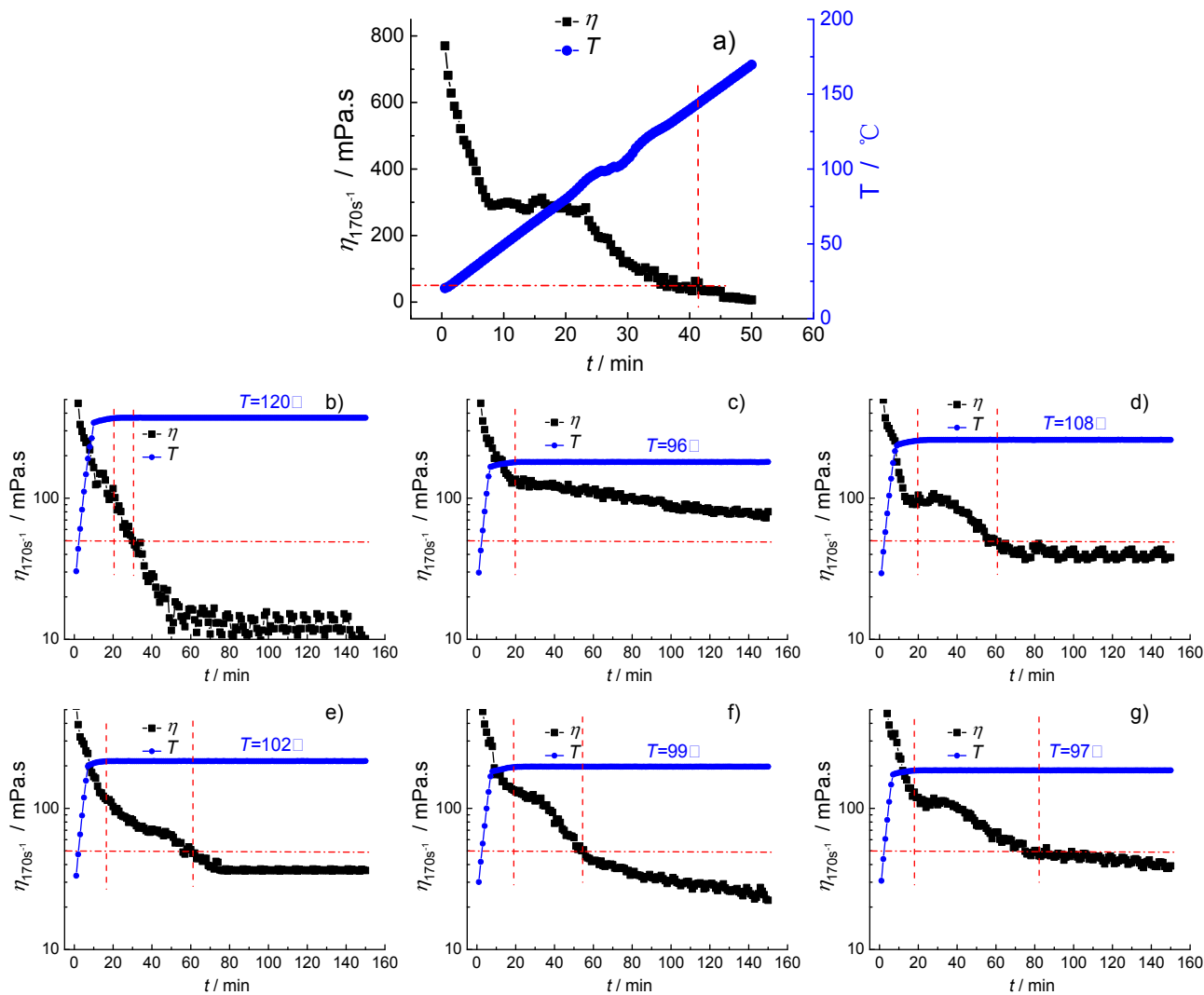


Fig.S2 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-g). The fracturing fluid is prepared by 0.4wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9.

Tab.S2 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.4wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9.

Parameters	Experimental results
$T_{\max}$	143.8°C
$T=120^\circ\text{C}$	9 min
$T=96^\circ\text{C}$	>133 min
$T=108^\circ\text{C}$	40 min
$T=102^\circ\text{C}$	47 min
$T=99^\circ\text{C}$	36 min
$T=97^\circ\text{C}$	63 min
$T_{\max}(\eta_0, t_0)$	96.5°C

1.3 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9

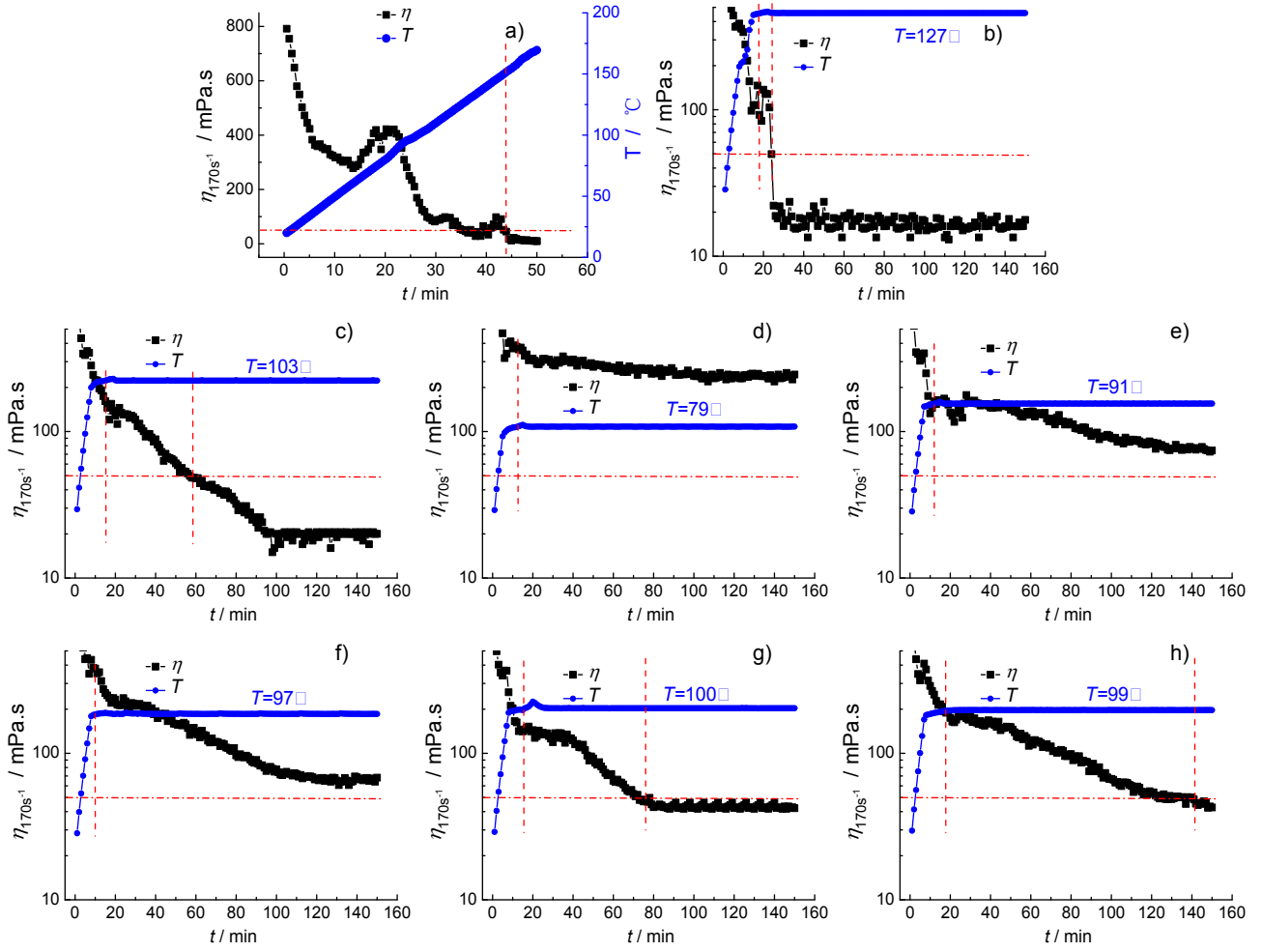


Fig.S3 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-h). The fracturing fluid is prepared by 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9.

Tab.S3 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9.

Parameters		Experimental results
$t(T)$	$T_{\max}$	150.9°C
	$T=127^\circ\text{C}$	6 min
	$T=103^\circ\text{C}$	45 min
	$T=79^\circ\text{C}$	>138 min
	$T=91^\circ\text{C}$	>138 min
	$T=97^\circ\text{C}$	>140 min
	$T=100^\circ\text{C}$	62 min
	$T=99^\circ\text{C}$	121 min
$T_{\max}(\eta_0, t_0)$		99.5°C

1.4 0.5wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9

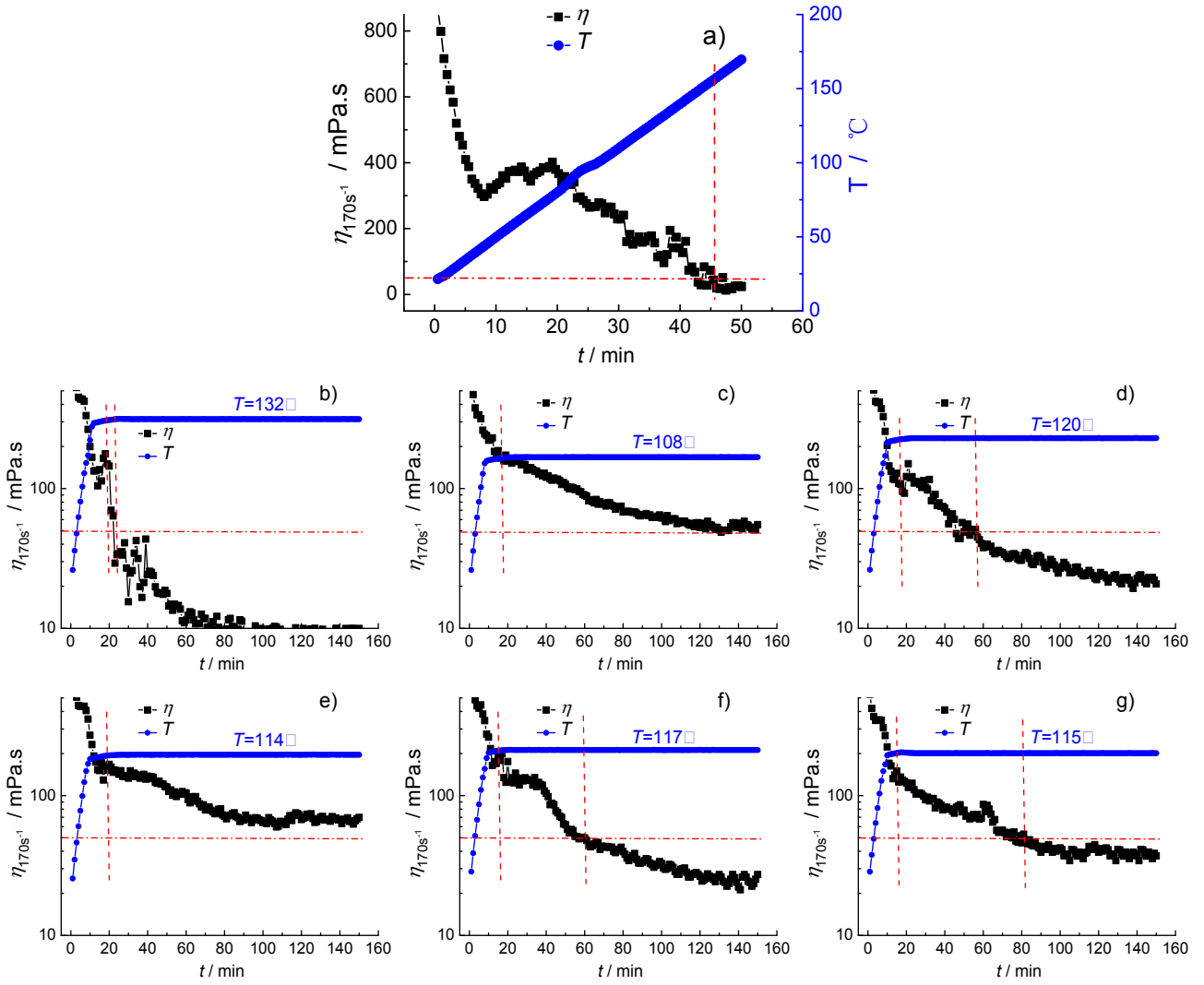


Fig.S4 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-g). The fracturing fluid is prepared by 0.5wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9.

Tab.S4 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.5wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9.

Parameters	Experimental results
$T_{\max}$	156.3°C
$T=132^\circ\text{C}$	2 min
$T=108^\circ\text{C}$	>133 min
$T=120^\circ\text{C}$	36 min
$T=114^\circ\text{C}$	>130 min
$T=117^\circ\text{C}$	45 min
$T=115^\circ\text{C}$	71 min
$T_{\max}(\eta_0, t_0)$	114.5°C

1.5 0.6wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9

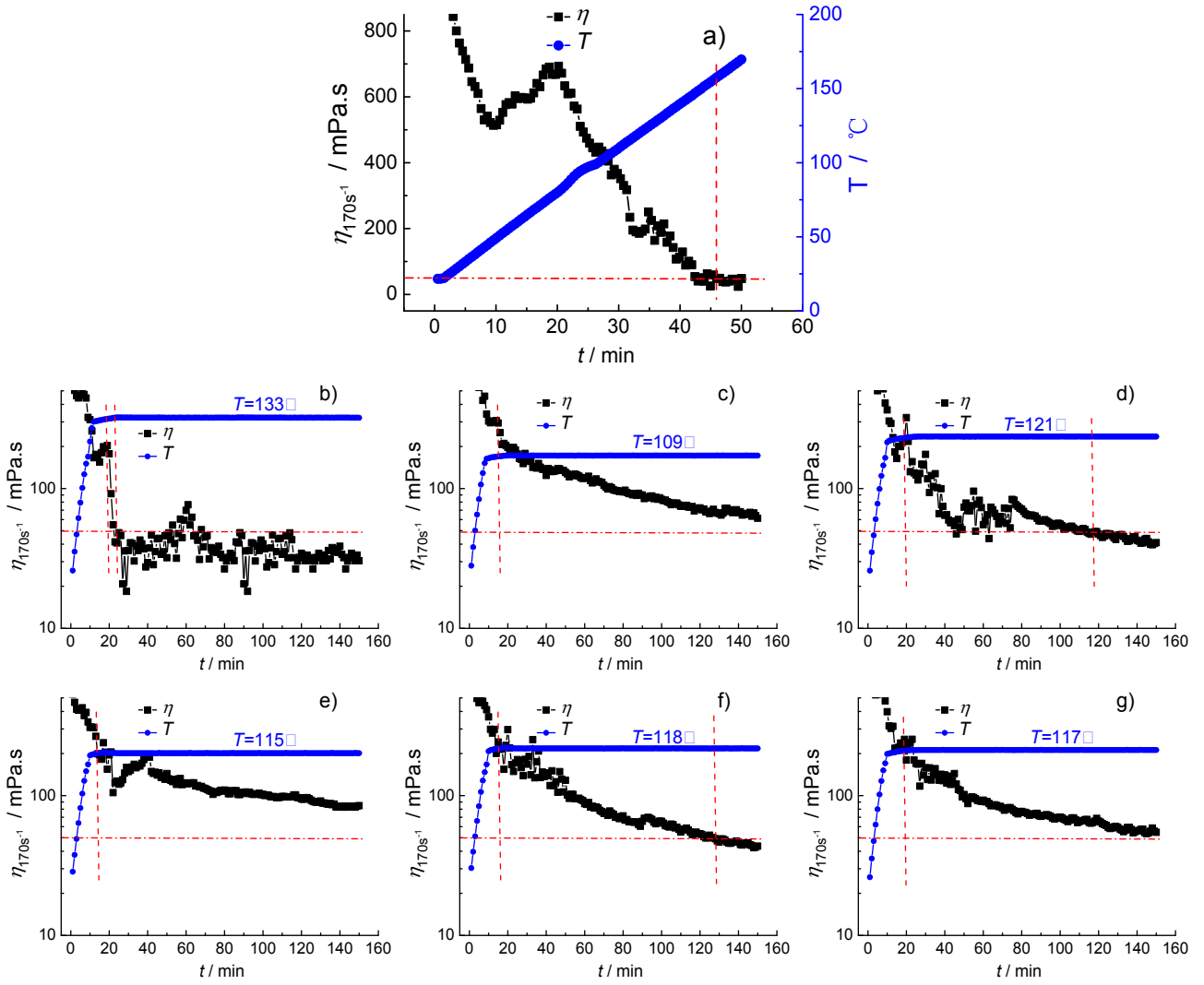


Fig.S5 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-g). The fracturing fluid is prepared by 0.6wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9.

Tab.S5 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.6wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9.

Parameters	Experimental results
$T_{\max}$	157.3°C
$T=133^{\circ}\text{C}$	2 min
$T=109^{\circ}\text{C}$	>134 min
$T=121^{\circ}\text{C}$	98 min
$T=115^{\circ}\text{C}$	>137 min
$T=118^{\circ}\text{C}$	115 min
$T=117^{\circ}\text{C}$	>130 min
$T_{\max}(\eta_0, t_0)$	117.5°C

1.6 0.7wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9

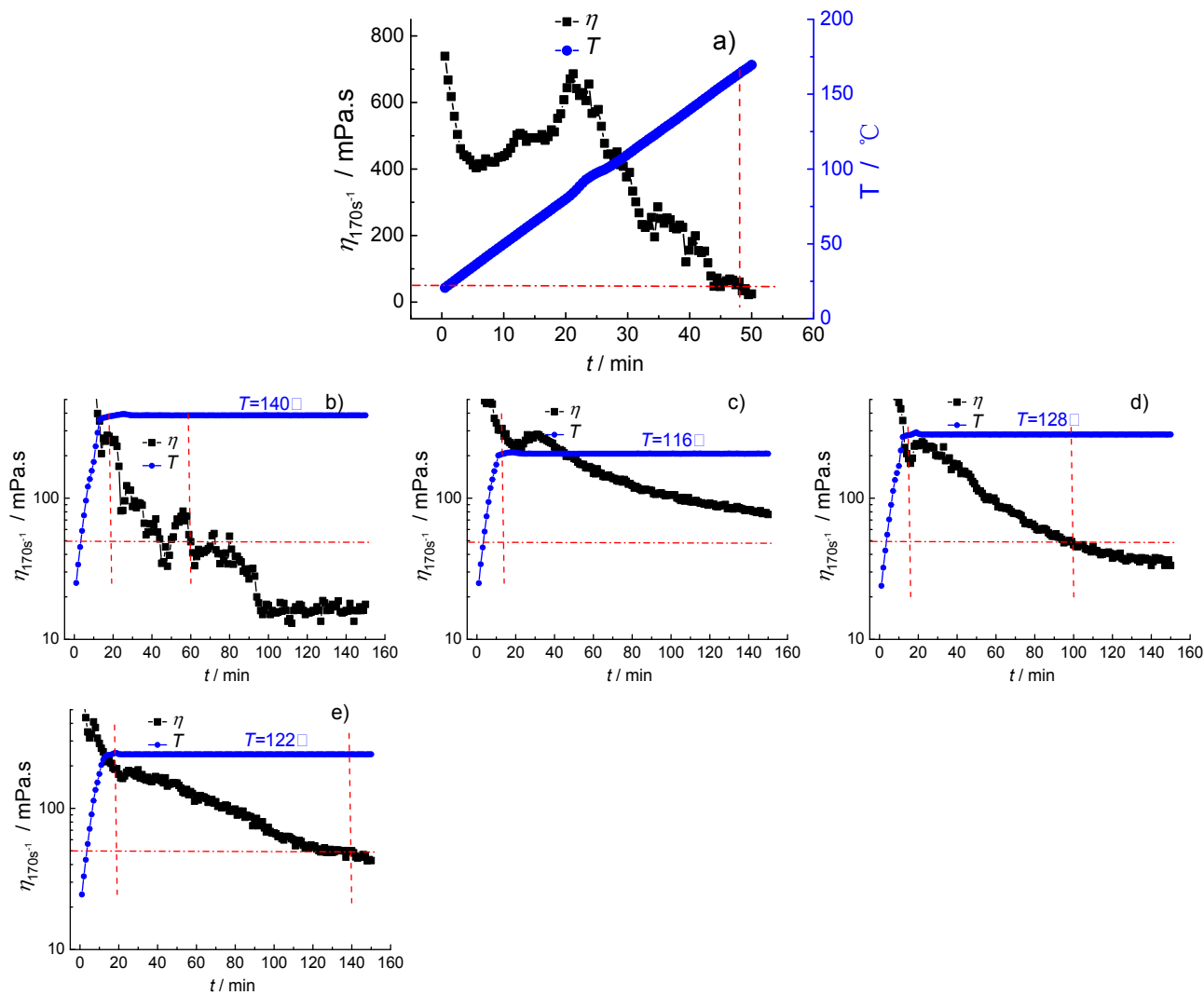


Fig.S6 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-e). The fracturing fluid is prepared by 0.7wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9.

Tab.S6 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.7wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9.

Parameters		Experimental results
$T_{\max}$		164.1 $^\circ\text{C}$
$t(T)$	$T=140^\circ\text{C}$	41 min
	$T=116^\circ\text{C}$	>138 min
	$T=128^\circ\text{C}$	83 min
	$T=122^\circ\text{C}$	120 min
$T_{\max}(\eta_0, t_0)$		122 $^\circ\text{C}$

1.7 0.8wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9

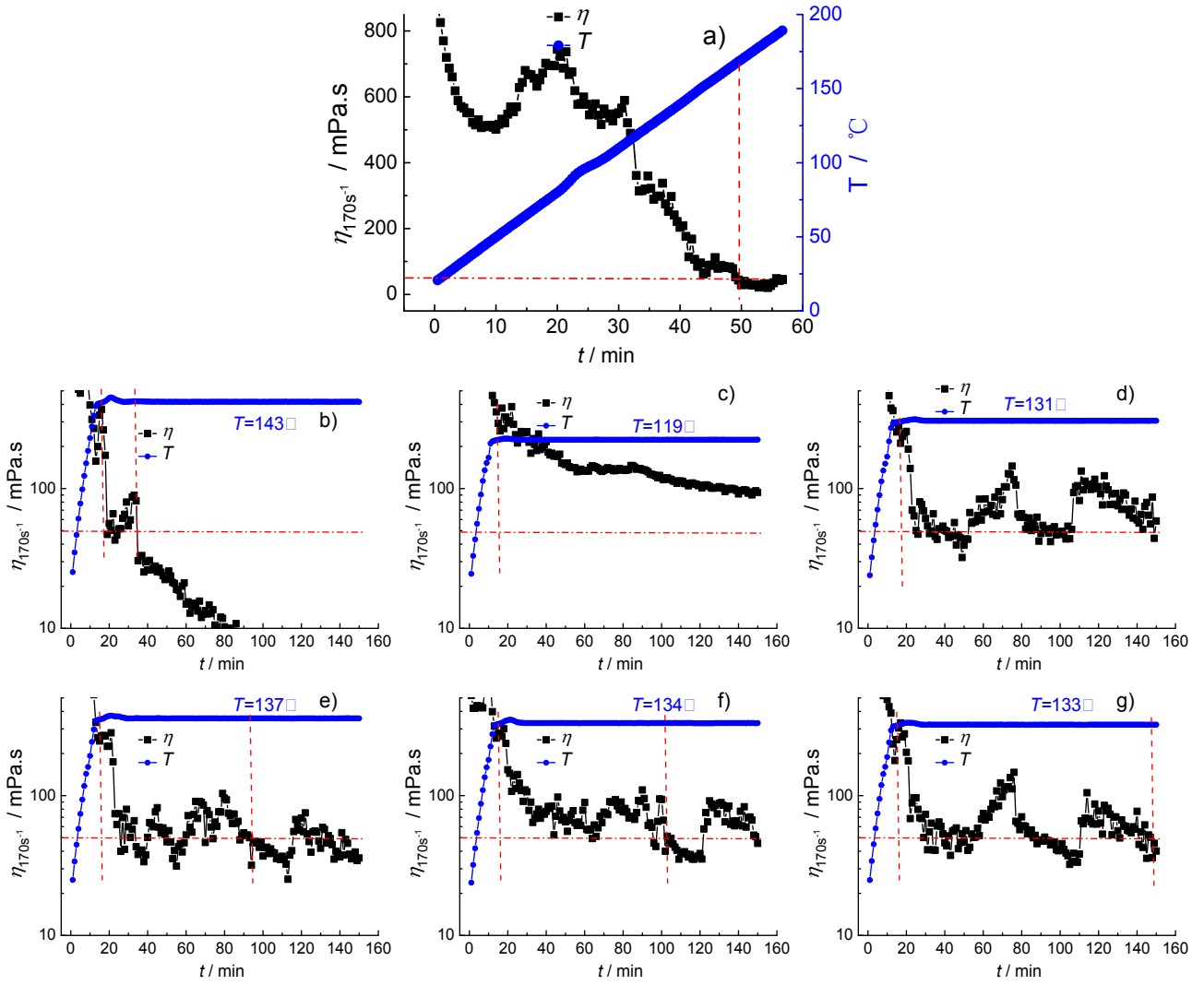


Fig.S7 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-g). The fracturing fluid is prepared by 0.8wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9.

Tab.S7 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.8wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=9.

Parameters		Experimental results
$T_{\max}$		167.3°C
$t(T)$	$T=143^\circ\text{C}$	18 min
	$T=119^\circ\text{C}$	>136 min
	$T=131^\circ\text{C}$	>132 min
	$T=137^\circ\text{C}$	76 min
	$T=134^\circ\text{C}$	90 min
	$T=133^\circ\text{C}$	>130 min
$T_{\max}(\eta_0, t_0)$		133.5°C

2. Effect of $\text{Na}_2\text{B}_4\text{O}_7$ concentration on the temperature resistance performance of HPG/ $\text{Na}_2\text{B}_4\text{O}_7$ fracturing fluid

2.1 0.45wt.% HPG/0.2wt.% $\text{Na}_2\text{B}_4\text{O}_7$ cross-linked at pH=9

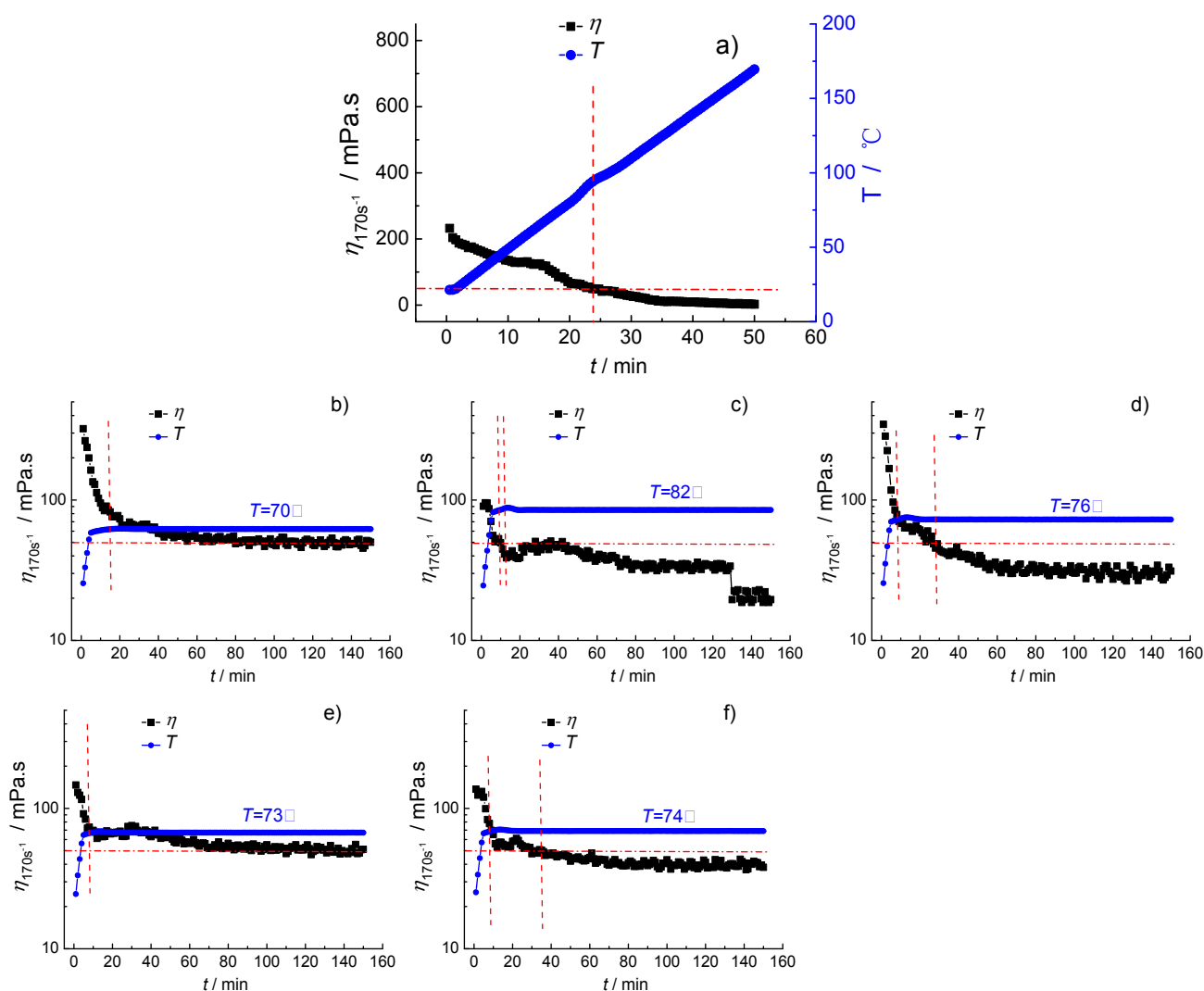


Fig.S8 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-f). The fracturing fluid is prepared by 0.45wt.% HPG/0.2wt.% $\text{Na}_2\text{B}_4\text{O}_7$ cross-linked at pH=9.

Tab.S8 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.45wt.% HPG/0.2wt.% $\text{Na}_2\text{B}_4\text{O}_7$ cross-linked at pH=9.

Parameters		Experimental results
$t(T)$	$T_{\max}$	94.1°C
	$T=70^\circ\text{C}$	$>136 \text{ min}$
	$T=82^\circ\text{C}$	0 min
	$T=76^\circ\text{C}$	19 min
	$T=73^\circ\text{C}$	$>141 \text{ min}$
$T_{\max}(\eta_0, t_0)$	$T=74^\circ\text{C}$	27 min
		73.5°C

2.2 0.45wt.% HPG/0.3wt.% Na₂B₄O₇ cross-linked at pH=9

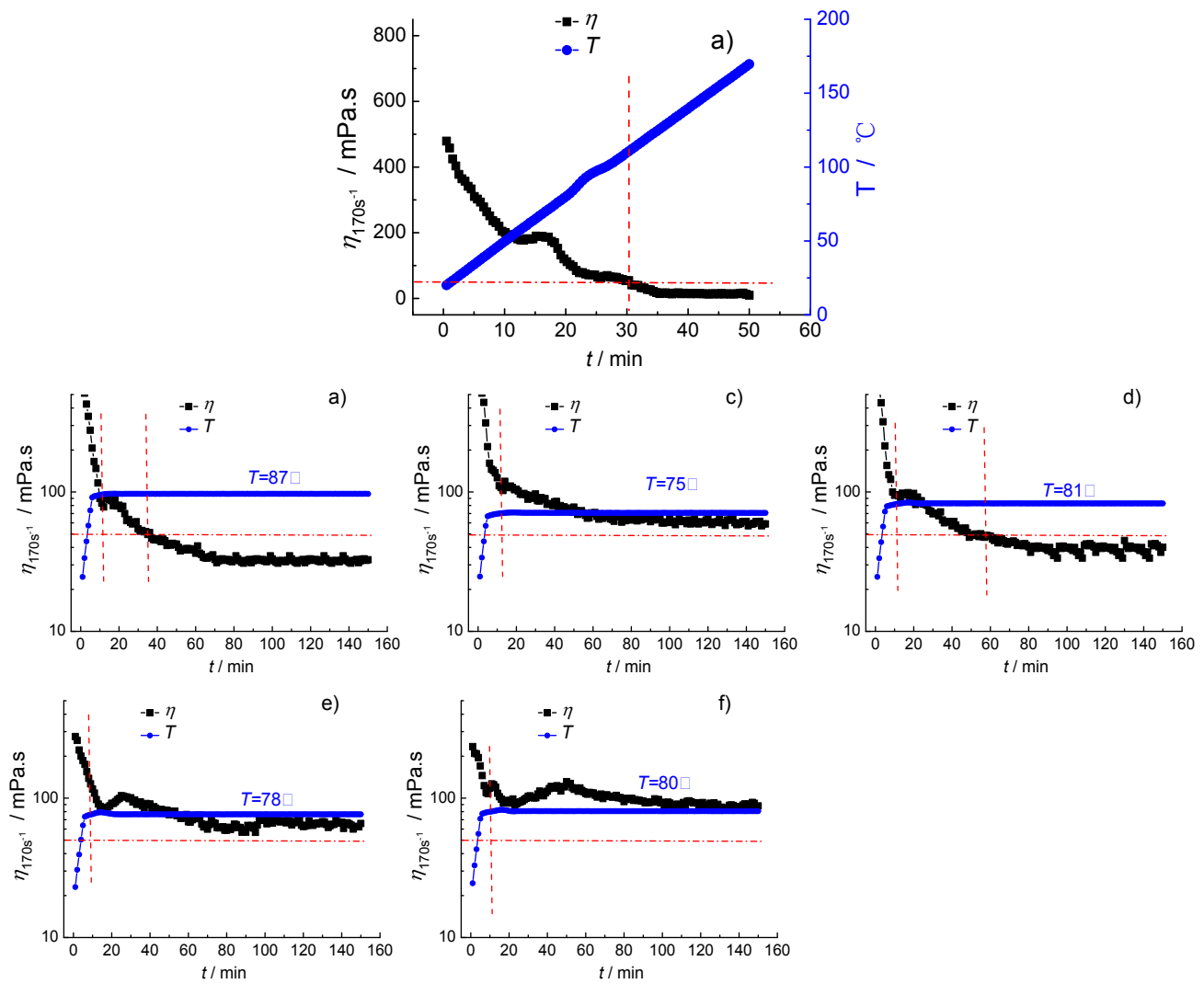


Fig.S9 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-f). The fracturing fluid is prepared by 0.45wt.% HPG/0.3wt.% Na₂B₄O₇ cross-linked at pH=9.

Tab.S9 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.45wt.% HPG/0.3wt.% Na₂B₄O₇ cross-linked at pH=9.

Parameters		Experimental results
$t(T)$	$T_{\max}$	111.1°C
	$T=87^\circ\text{C}$	24 min
	$T=75^\circ\text{C}$	>137 min
	$T=81^\circ\text{C}$	45 min
	$T=78^\circ\text{C}$	>141 min
	$T=80^\circ\text{C}$	>139 min
$T_{\max}(\eta_0, t_0)$		80.5°C

2.3 0.45wt.% HPG/0.4wt.% Na₂B₄O₇ cross-linked at pH=9

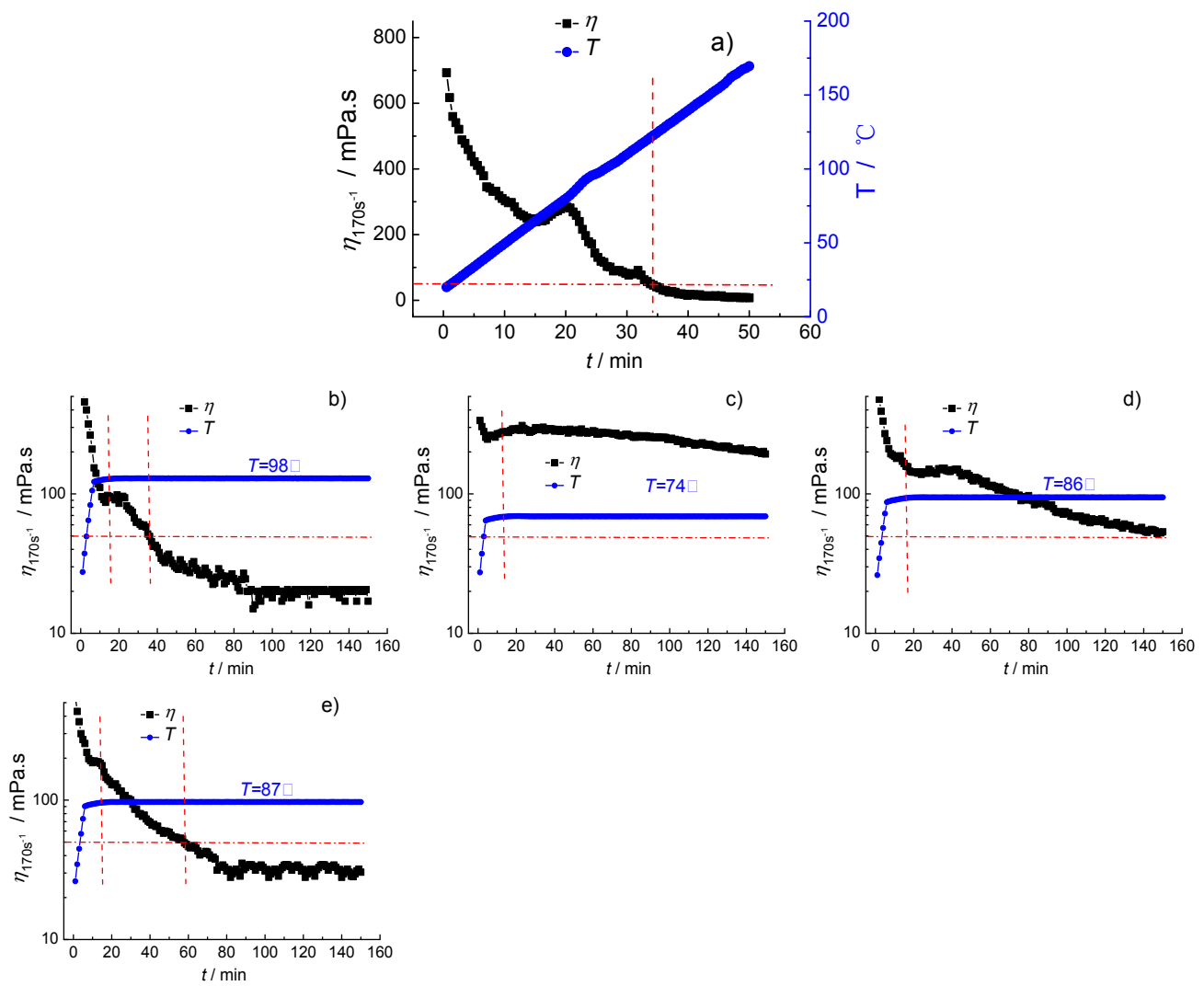


Fig.S10 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-e). The fracturing fluid is prepared by 0.45wt.% HPG/0.4wt.% Na₂B₄O₇ cross-linked at pH=9.

Tab.S10 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.45wt.% HPG/0.4wt.% Na₂B₄O₇ cross-linked at pH=9.

Parameters	Experimental results
$T_{\max}$	122.3°C
$T = 98^\circ\text{C}$	19 min
$T = 74^\circ\text{C}$	>136 min
$T = 86^\circ\text{C}$	>133 min
$T = 87^\circ\text{C}$	43 min
$T_{\max}(\eta_0, t_0)$	86.5°C

2.4 0.45wt.% HPG/0.5wt.% Na₂B₄O₇ cross-linked at pH=9

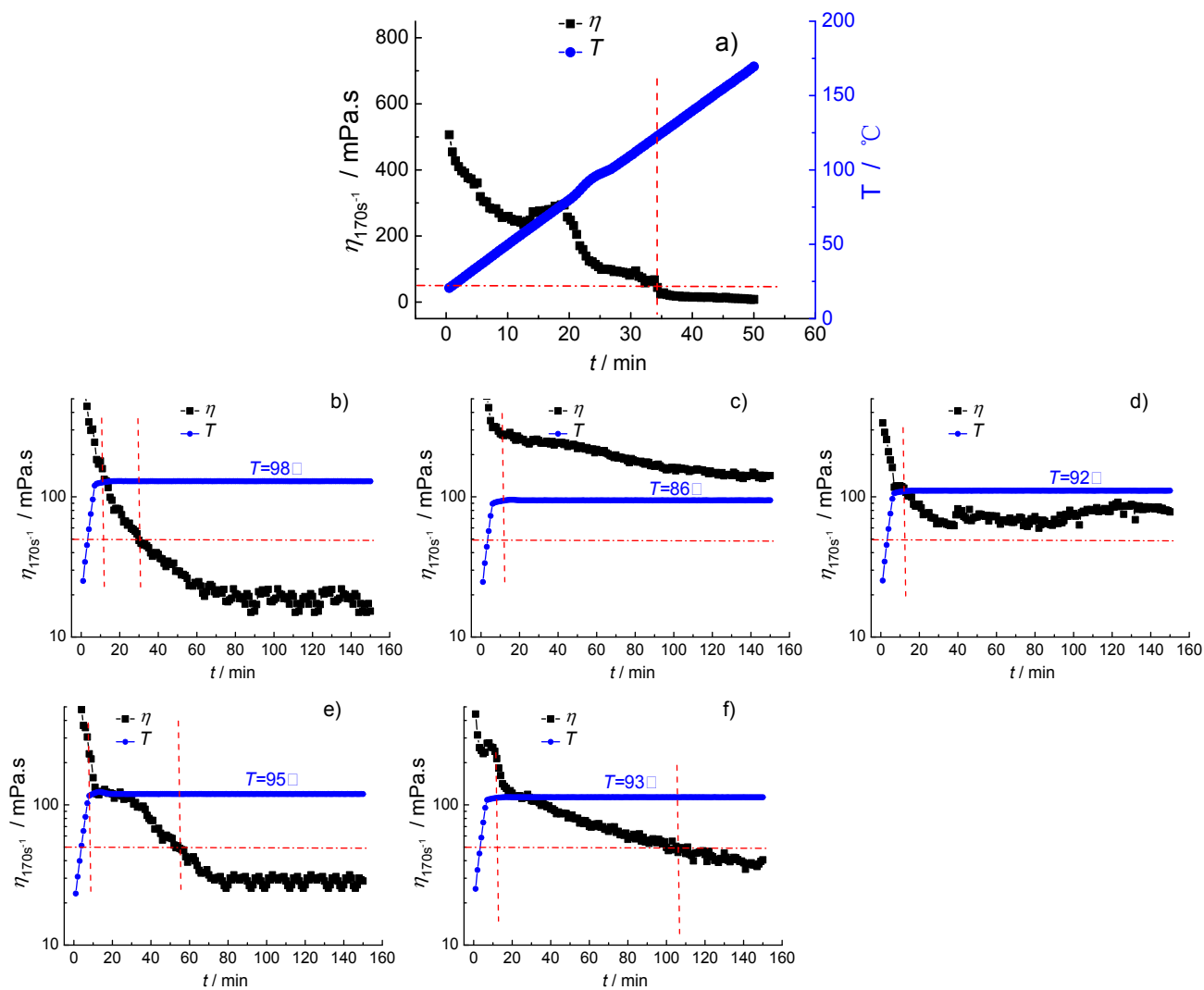


Fig.S11 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-f). The fracturing fluid is prepared by 0.45wt.% HPG/0.5wt.% Na₂B₄O₇ cross-linked at pH=9.

Tab.S11 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.45wt.% HPG/0.5wt.% Na₂B₄O₇ cross-linked at pH=9.

Parameters		Experimental results
$t(T)$	$T_{\max}$	122.2°C
	$T=98^{\circ}\text{C}$	16 min
	$T=86^{\circ}\text{C}$	>138min
	$T=92^{\circ}\text{C}$	>136 min
	$T=95^{\circ}\text{C}$	46 min
	$T=93^{\circ}\text{C}$	92 min
$T_{\max}(\eta_0, t_0)$		92.5°C

2.5 0.45wt.% HPG/0.6wt.% Na₂B₄O₇ cross-linked at pH=9

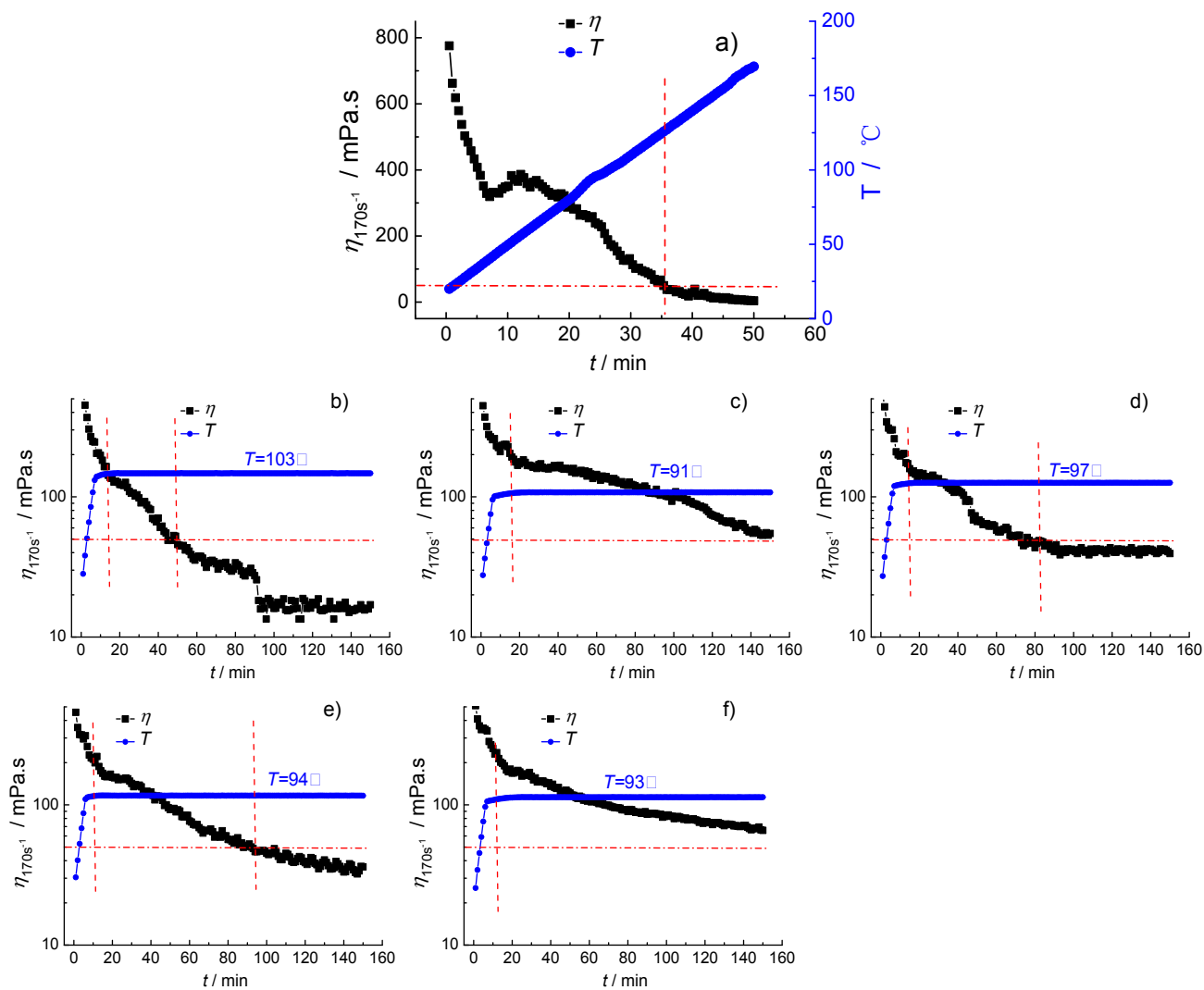


Fig.S12 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-f). The fracturing fluid is prepared by 0.45wt.% HPG/0.6wt.% Na₂B₄O₇ cross-linked at pH=9.

Tab.S12 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.45wt.% HPG/0.6wt.% Na₂B₄O₇ cross-linked at pH=9.

Parameters		Experimental results
$t(T)$	$T_{\max}$	127.1 °C
	$T=103^{\circ}\text{C}$	37 min
	$T=91^{\circ}\text{C}$	>132 min
	$T=97^{\circ}\text{C}$	58 min
	$T=94^{\circ}\text{C}$	83 min
	$T=93^{\circ}\text{C}$	>131 min
$T_{\max}(\eta_0, t_0)$		93.5 °C

2.6 0.45wt.% HPG/0.7wt.% Na₂B₄O₇ cross-linked at pH=9

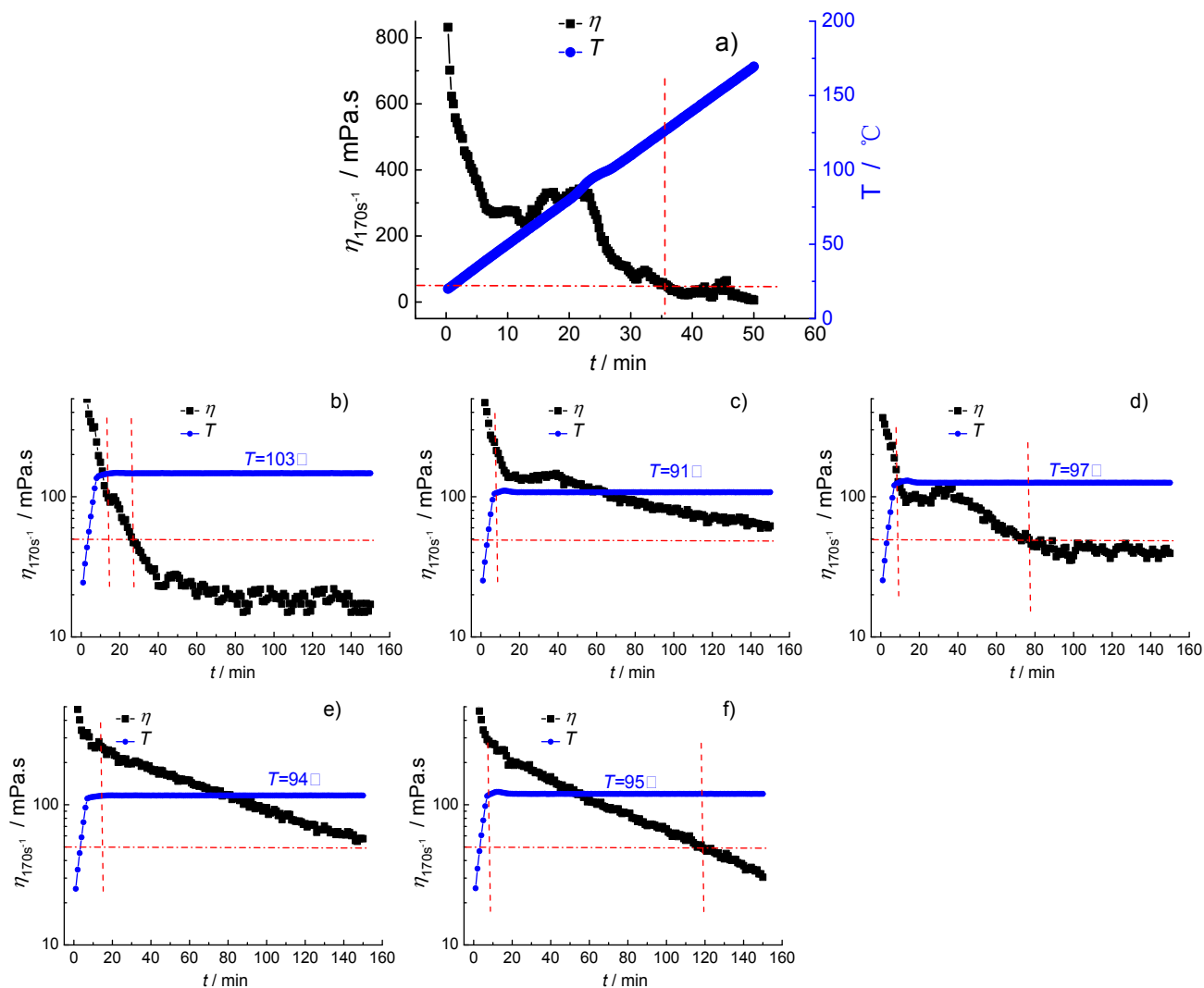


Fig.S13 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-f). The fracturing fluid is prepared by 0.45wt.% HPG/0.7wt.% Na₂B₄O₇ cross-linked at pH=9.

Tab.S13 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.45wt.% HPG/0.7wt.% Na₂B₄O₇ cross-linked at pH=9.

Parameters		Experimental results
$t(T)$	$T_{\max}$	127.3°C
	$T=103^{\circ}\text{C}$	13 min
	$T=91^{\circ}\text{C}$	>142min
	$T=97^{\circ}\text{C}$	68 min
	$T=94^{\circ}\text{C}$	>135 min
	$T=95^{\circ}\text{C}$	111 min
$T_{\max}(\eta_0, t_0)$		94.5°C

2.7 0.45wt.% HPG/1.0wt.% Na₂B₄O₇ cross-linked at pH=9

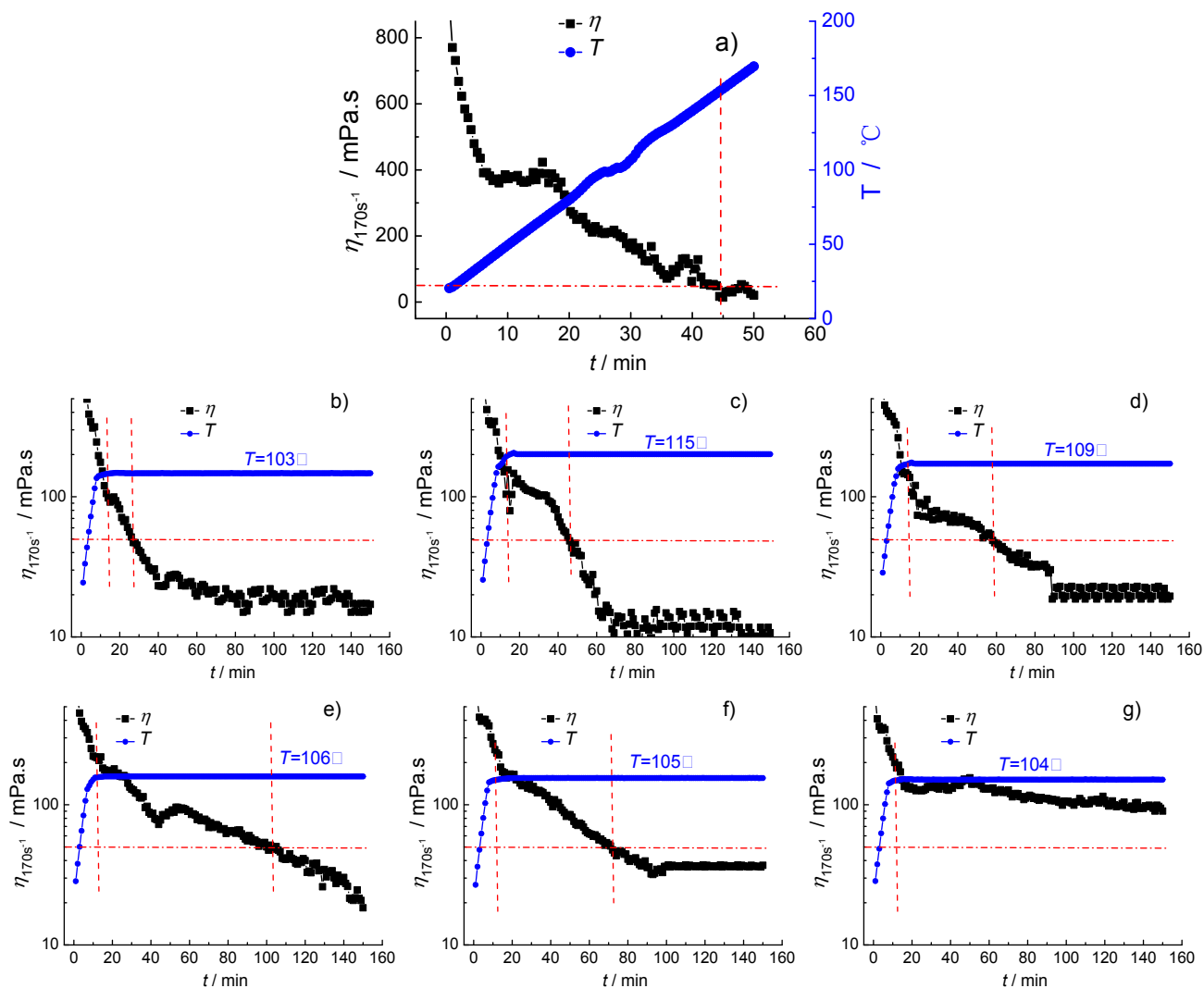


Fig.S14 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-g). The fracturing fluid is prepared by 0.45wt.% HPG/1.0wt.% Na₂B₄O₇ cross-linked at pH=9.

Tab.S14 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.45wt.% HPG/1.0wt.% Na₂B₄O₇ cross-linked at pH=9.

Parameters		Experimental results
$T_{\max}$		151.4°C
$t(T)$	$T=103^\circ\text{C}$	>135 min
	$T=115^\circ\text{C}$	31 min
	$T=109^\circ\text{C}$	44 min
	$T=106^\circ\text{C}$	93 min
	$T=105^\circ\text{C}$	59 min
	$T=104^\circ\text{C}$	>137 min
$T_{\max}(\eta_0, t_0)$		104.5°C

2.8 0.45wt.% HPG/1.2wt.% Na₂B₄O₇ cross-linked at pH=9

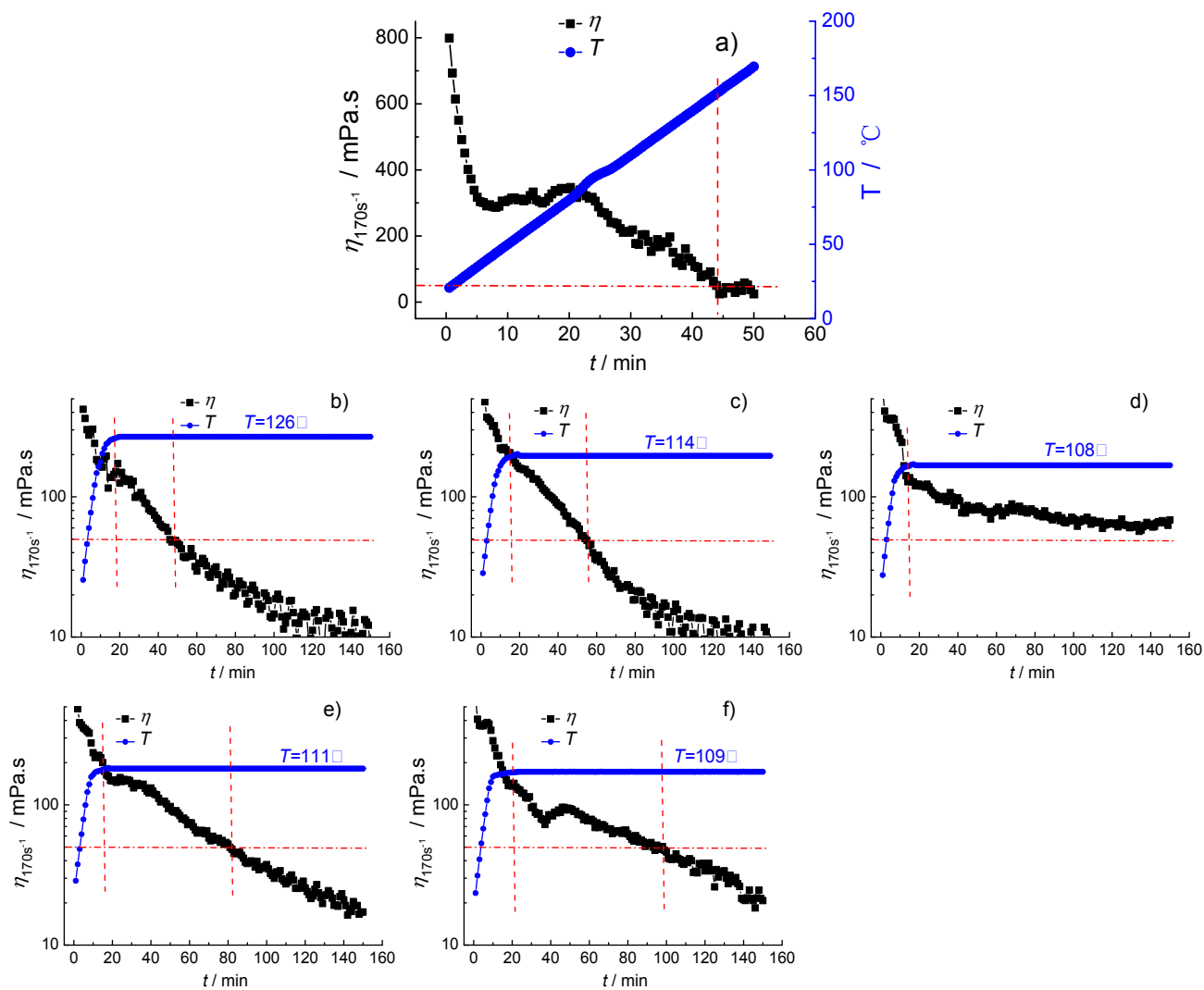


Fig.S15 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-f). The fracturing fluid is prepared by 0.45wt.% HPG/1.2wt.% Na₂B₄O₇ cross-linked at pH=9.

Tab.S15 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.45wt.% HPG/1.2wt.% Na₂B₄O₇ cross-linked at pH=9.

Parameters		Experimental results
$t(T)$	$T_{\max}$	151.7°C
	$T=126^{\circ}\text{C}$	30 min
	$T=114^{\circ}\text{C}$	39 min
	$T=108^{\circ}\text{C}$	>135 min
	$T=111^{\circ}\text{C}$	66 min
	$T=109^{\circ}\text{C}$	78 min
$T_{\max}(\eta_0, t_0)$		108.5°C

2.9 0.45wt.% HPG/1.5wt.% Na₂B₄O₇ cross-linked at pH=9

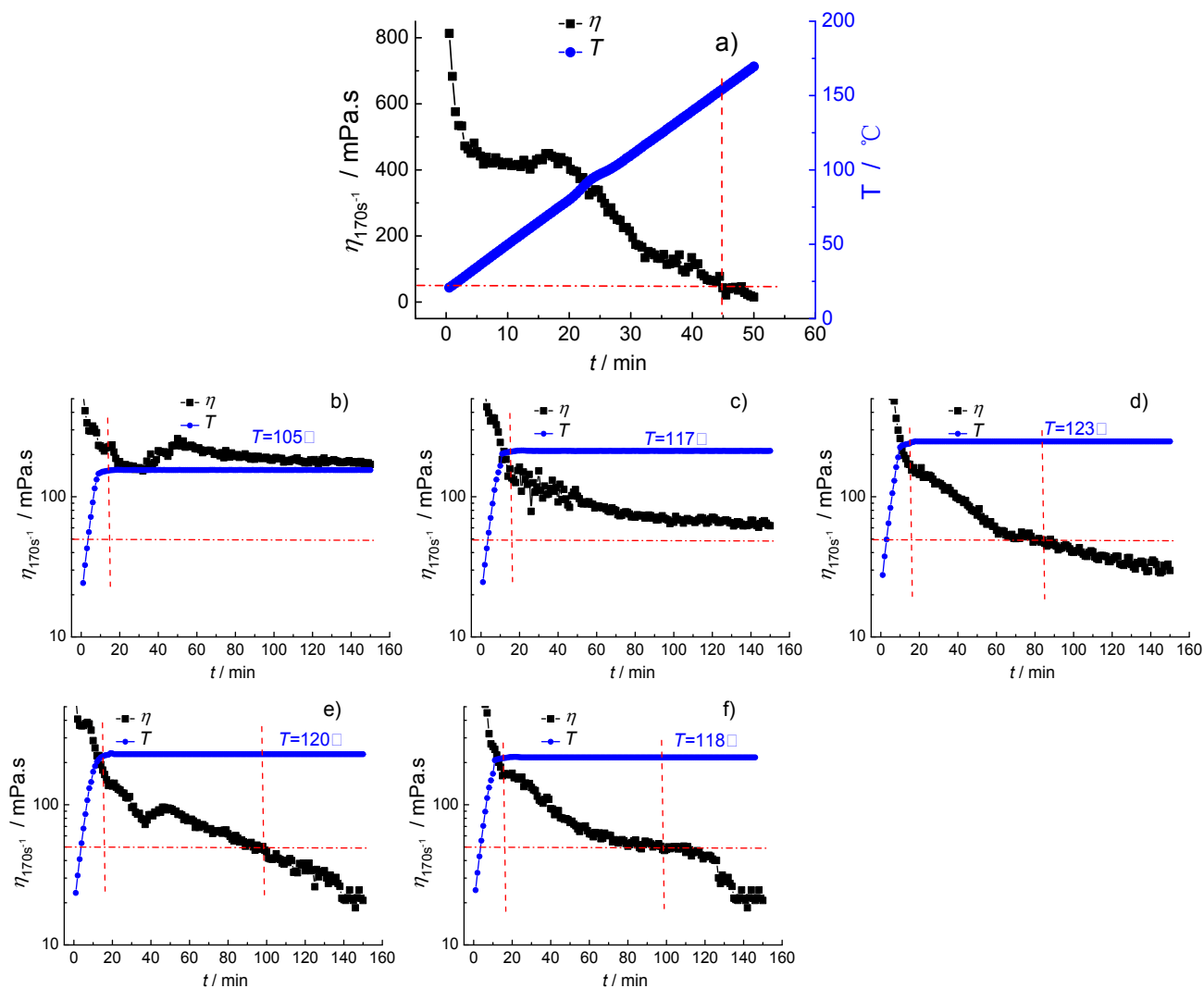


Fig.S16 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-f). The fracturing fluid is prepared by 0.45wt.% HPG/1.5wt.% Na₂B₄O₇ cross-linked at pH=9.

Tab.S16 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.45wt.% HPG/1.5wt.% Na₂B₄O₇ cross-linked at pH=9.

Parameters		Experimental results
$T_{\max}$		152.9°C
$t(T)$	$T=105^{\circ}\text{C}$	>135 min
	$T=117^{\circ}\text{C}$	>133 min
	$T=123^{\circ}\text{C}$	68 min
	$T=120^{\circ}\text{C}$	81 min
	$T=118^{\circ}\text{C}$	95 min
$T_{\max}(\eta_0, t_0)$		117.5°C

2.10 0.45wt.% HPG/1.8wt.% Na₂B₄O₇ cross-linked at pH=9

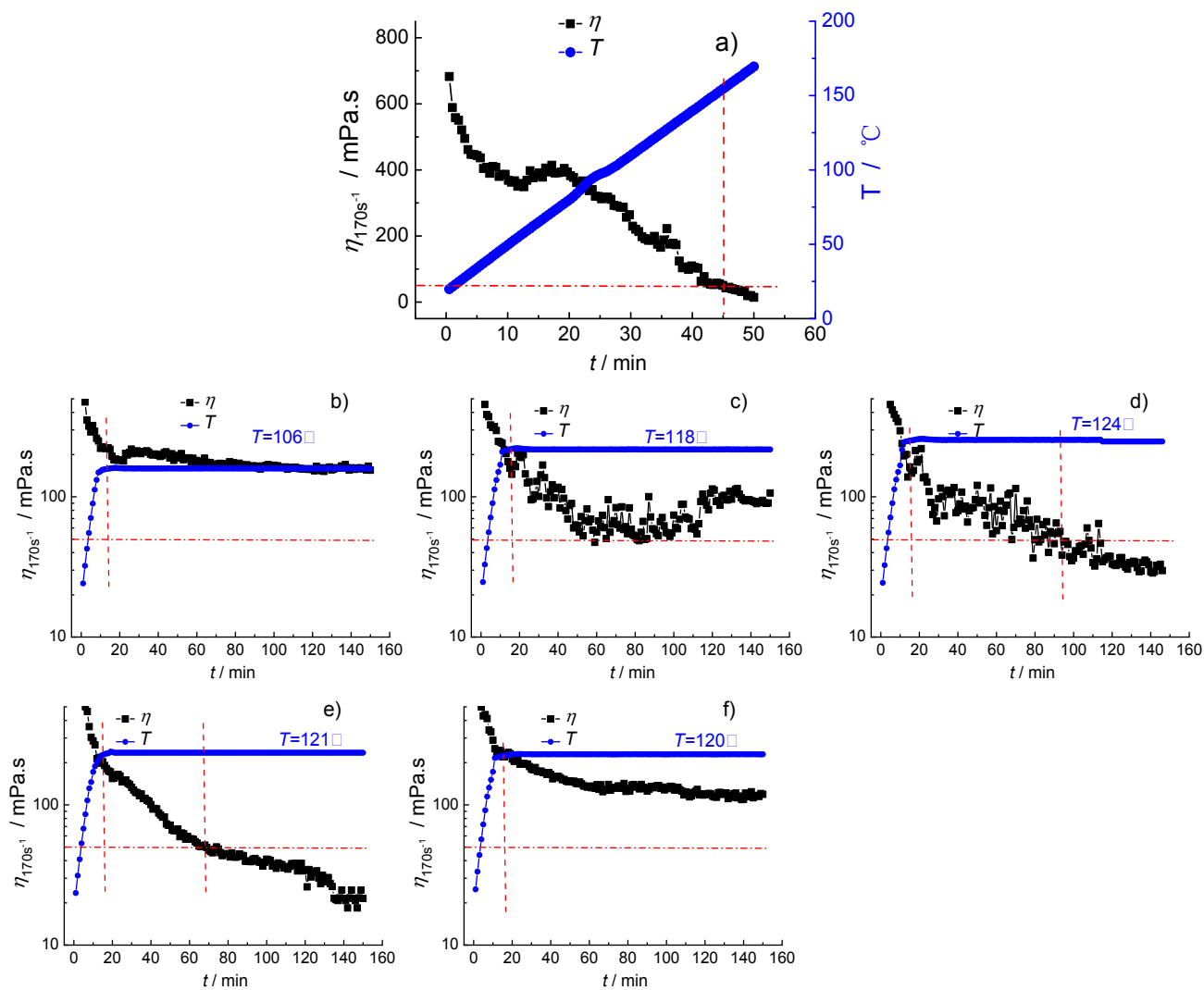


Fig.S17 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-f). The fracturing fluid is prepared by 0.45wt.% HPG/1.8wt.% Na₂B₄O₇ cross-linked at pH=9.

Tab.S17 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.45wt.% HPG/1.8wt.% Na₂B₄O₇ cross-linked at pH=9.

Parameters		Experimental results
$T_{\max}$		154.3°C
$t(T)$	$T=106^{\circ}\text{C}$	>137 min
	$T=118^{\circ}\text{C}$	>136 min
	$T=124^{\circ}\text{C}$	77 min
	$T=121^{\circ}\text{C}$	51 min
	$T=120^{\circ}\text{C}$	>132 min
$T_{\max}(\eta_0, t_0)$		120.5°C

2.11 0.45wt.% HPG/2.0wt.% Na₂B₄O₇ cross-linked at pH=9

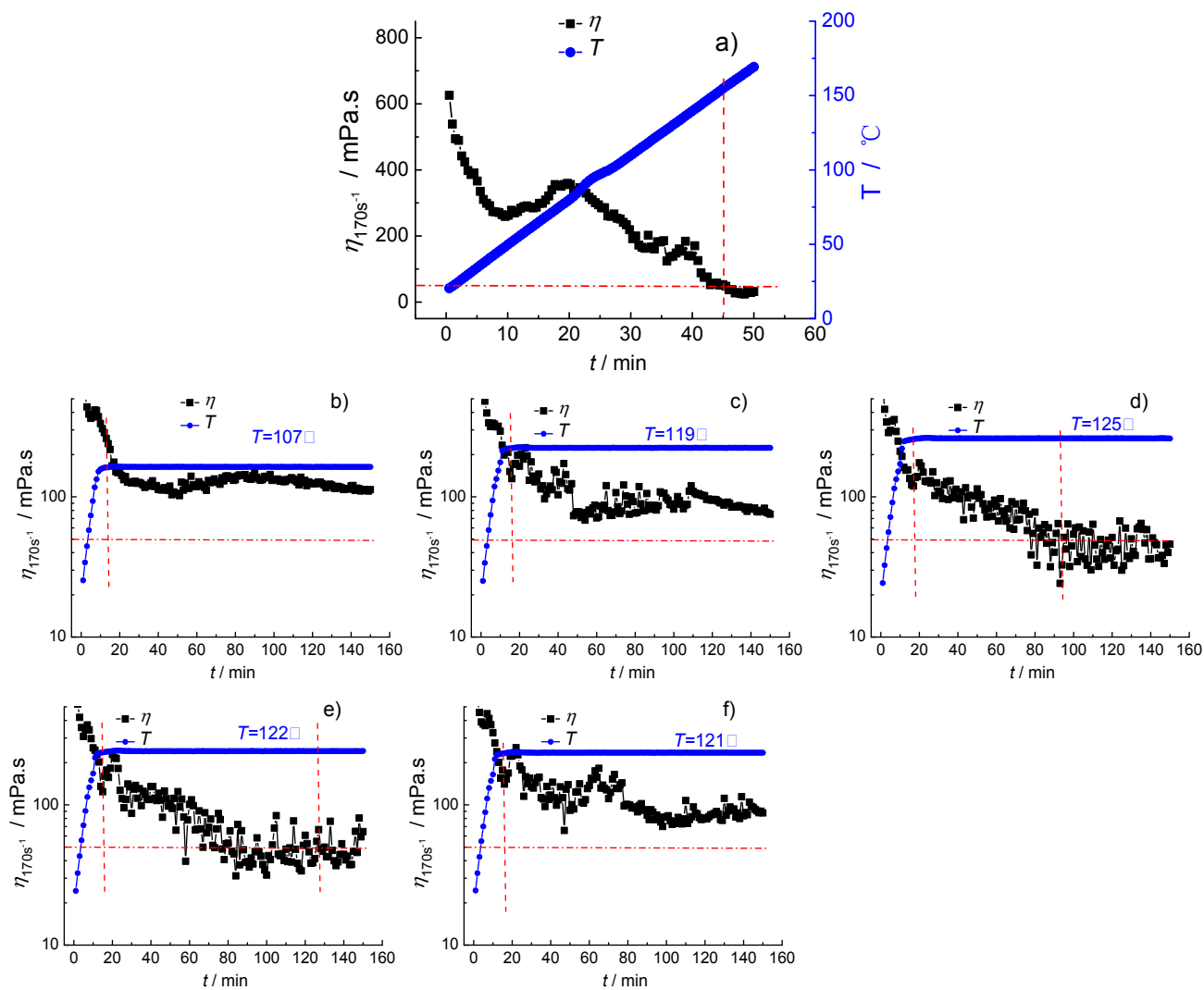


Fig.S18 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-f). The fracturing fluid is prepared by 0.45wt.% HPG/2.0wt.% Na₂B₄O₇ cross-linked at pH=9.

Tab.S18 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.45wt.% HPG/2.0wt.% Na₂B₄O₇ cross-linked at pH=9.

Parameters		Experimental results
$T_{\max}$		155.5°C
$t(T)$	$T=107^{\circ}\text{C}$	>137 min
	$T=119^{\circ}\text{C}$	>135 min
	$T=125^{\circ}\text{C}$	75 min
	$T=122^{\circ}\text{C}$	110 min
	$T=121^{\circ}\text{C}$	>134 min
$T_{\max}(\eta_0, t_0)$		121.5°C

3. Effect of pH on the temperature resistance performance of HPG/Na₂B₄O₇ fracturing fluid

3.1 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=7

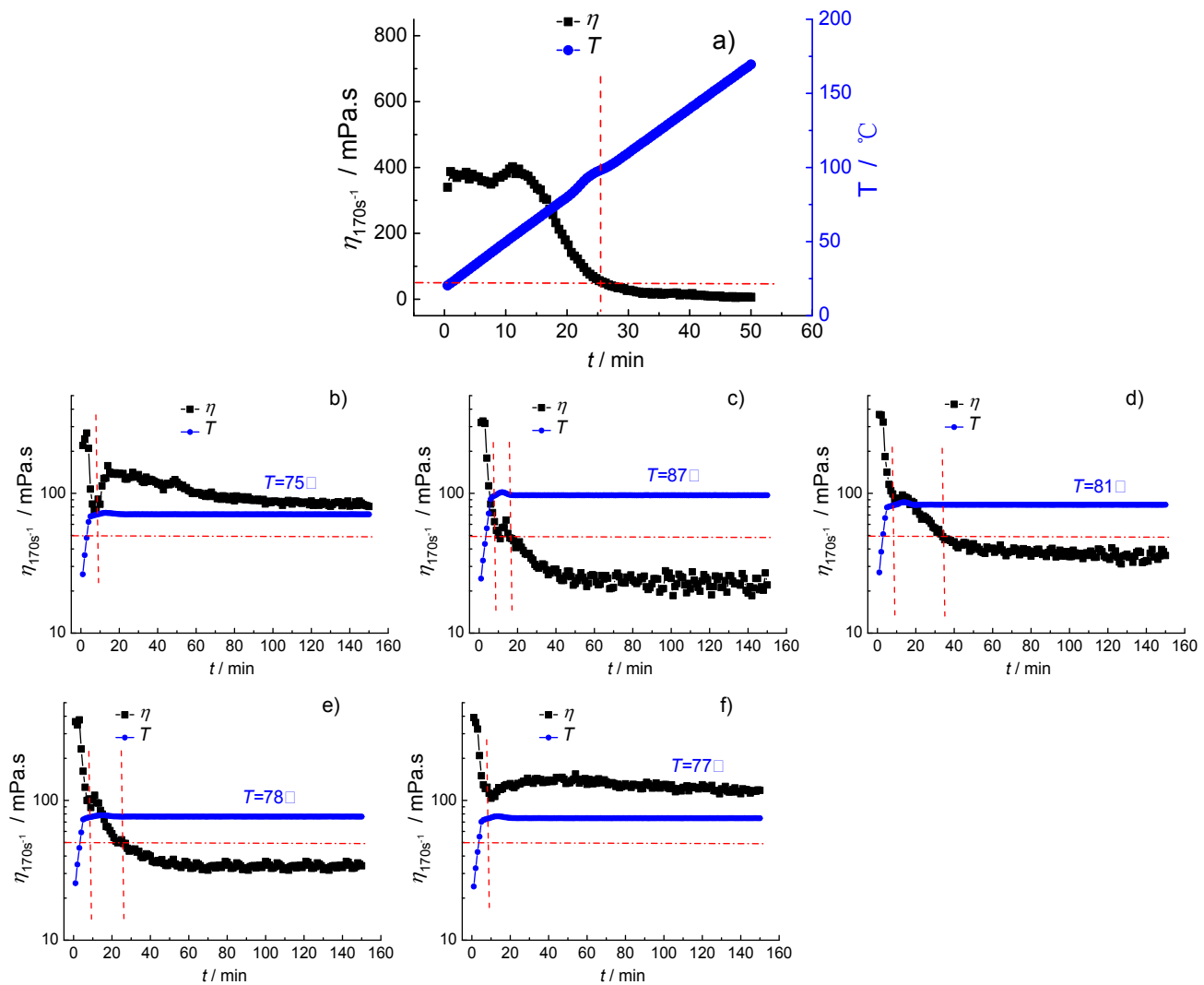


Fig.S19 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-f). The fracturing fluid is prepared by 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=7.

Tab.S19 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=7.

Parameters		Experimental results
$t(T)$	$T_{\max}$	98.7°C
	$T=75^\circ\text{C}$	>141 min
	$T=87^\circ\text{C}$	8 min
	$T=81^\circ\text{C}$	25 min
	$T=78^\circ\text{C}$	17 min
	$T=77^\circ\text{C}$	>141 min
$T_{\max}(\eta_0, t_0)$		77.5°C

3.2 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=8

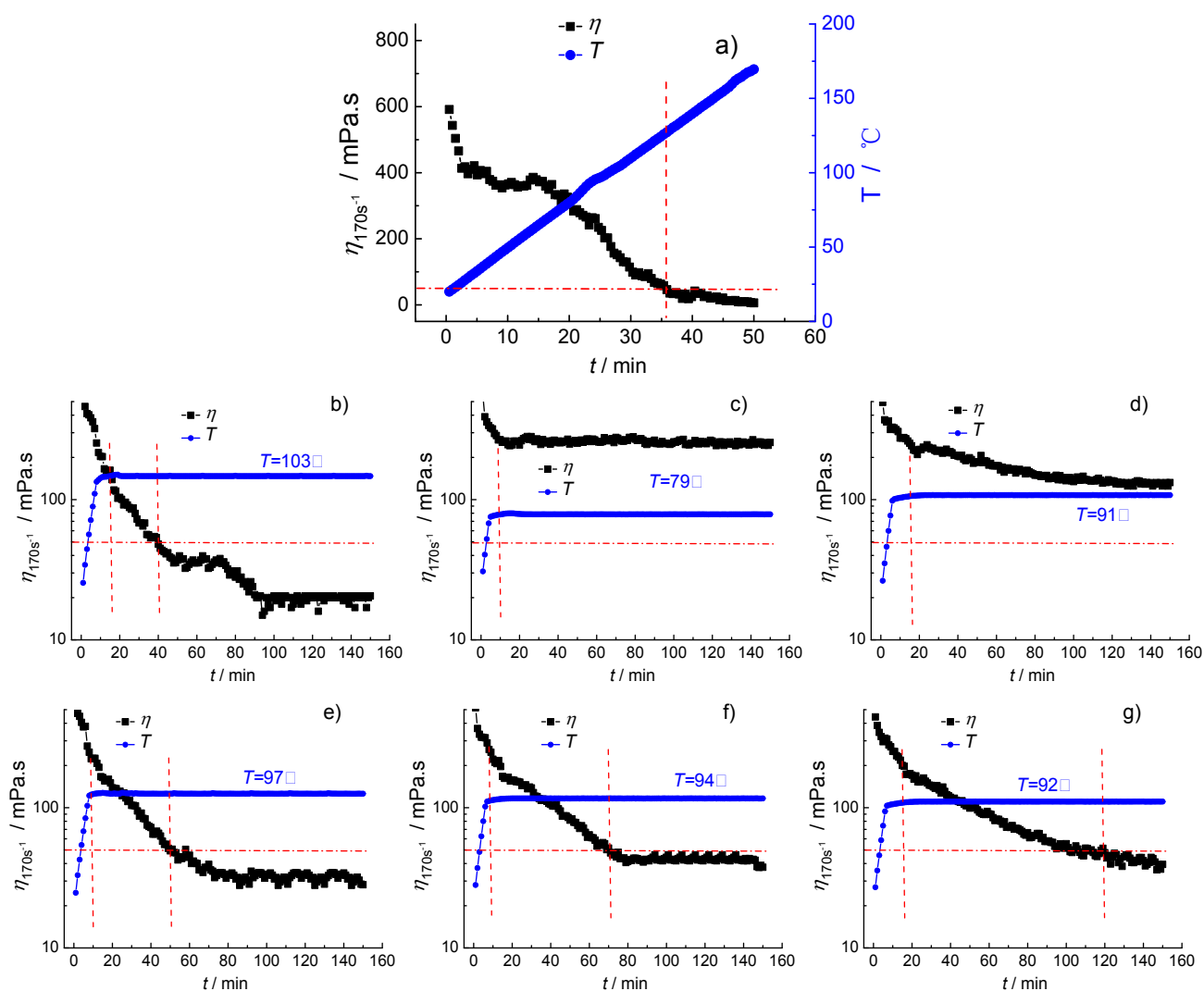


Fig.S20 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-g). The fracturing fluid is prepared by 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=8.

Tab.S20 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=8.

Parameters	Experimental results
$T_{\max}$	127.3°C
$T=103^{\circ}\text{C}$	17 min
$T=79^{\circ}\text{C}$	>140 min
$T=91^{\circ}\text{C}$	>133 min
$T=97^{\circ}\text{C}$	43 min
$T=94^{\circ}\text{C}$	59 min
$T=92^{\circ}\text{C}$	103 min
$T_{\max}(\eta_0, t_0)$	91.5°C

3.3 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=10

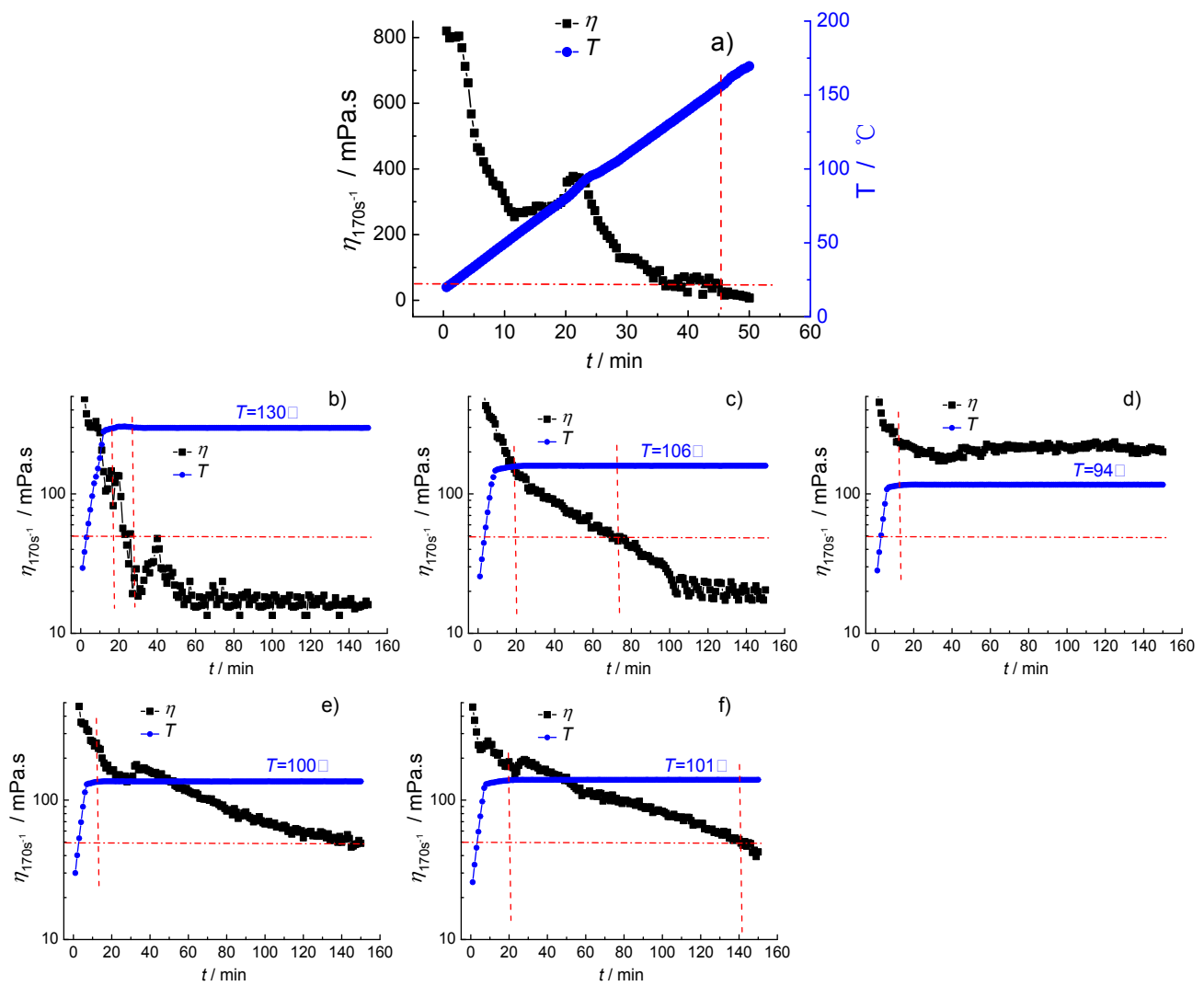


Fig.S21 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-f). The fracturing fluid is prepared by 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=10.

Tab.S21 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=10.

Parameters		Experimental results
$t(T)$	$T_{\max}$	154.1 °C
	$T=130^{\circ}\text{C}$	7 min
	$T=106^{\circ}\text{C}$	51 min
	$T=94^{\circ}\text{C}$	>135 min
	$T=100^{\circ}\text{C}$	>133 min
	$T=101^{\circ}\text{C}$	120 min
$T_{\max}(\eta_0, t_0)$		101 °C

3.4 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=11

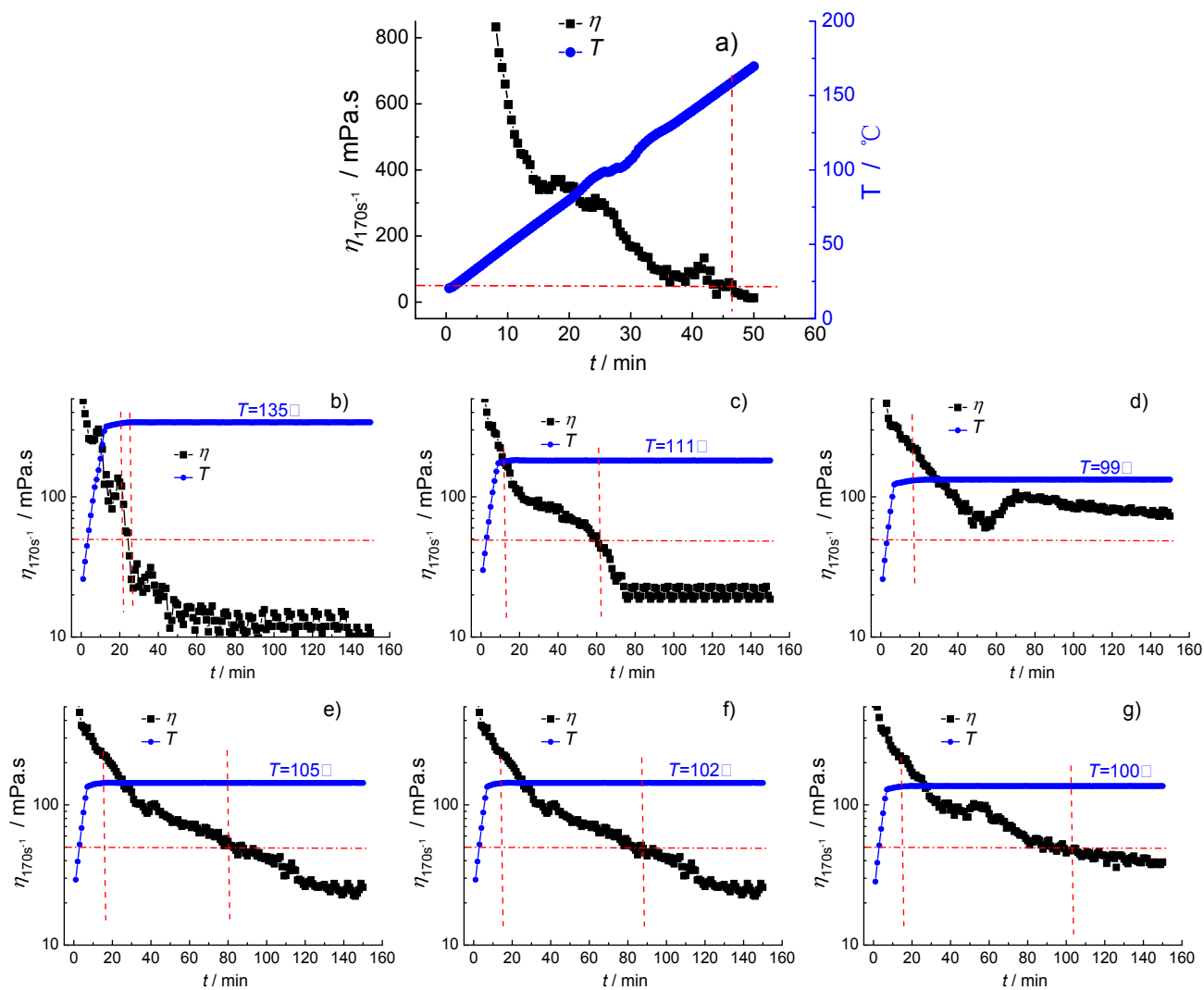


Fig.S22 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-g). The fracturing fluid is prepared by 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=11.

Tab.S22 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=11.

Parameters	Experimental results
$T_{\max}$	159.3°C
$T=135^{\circ}\text{C}$	3 min
$T=111^{\circ}\text{C}$	48 min
$T=99^{\circ}\text{C}$	>132 min
$T=105^{\circ}\text{C}$	63 min
$T=102^{\circ}\text{C}$	73 min
$T=100^{\circ}\text{C}$	88 min
$T_{\max}(\eta_0, t_0)$	99.5°C

3.5 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=12

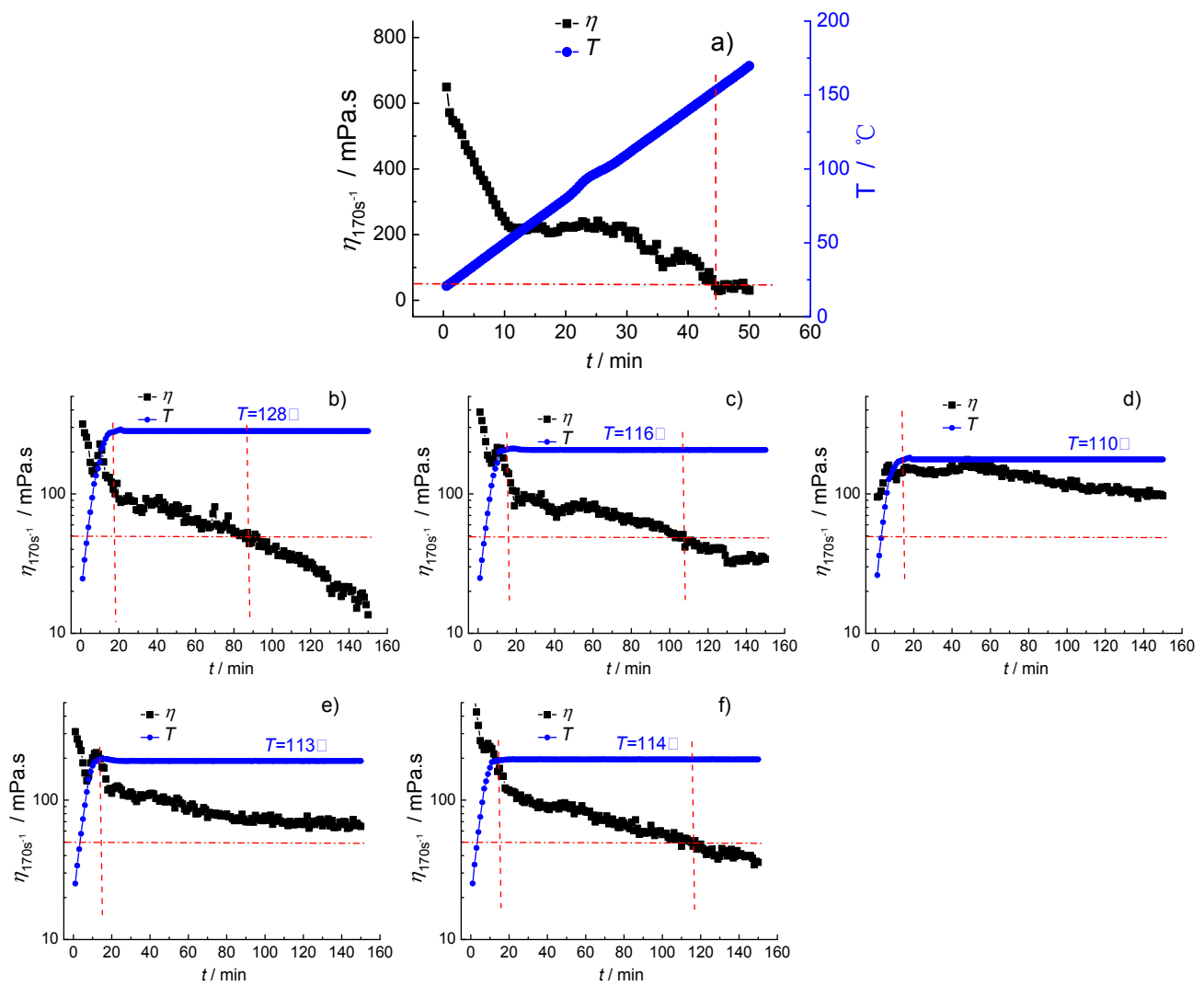


Fig.S23 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-f). The fracturing fluid is prepared by 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=12.

Tab.S23 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=12.

Parameters		Experimental results
$T_{\max}$		152.3°C
$t(T)$	$T=128^{\circ}\text{C}$	69 min
	$T=116^{\circ}\text{C}$	91 min
	$T=110^{\circ}\text{C}$	>136 min
	$T=113^{\circ}\text{C}$	>136 min
	$T=114^{\circ}\text{C}$	100 min
$T_{\max}(\eta_0, t_0)$		113.5°C

3.6 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=13

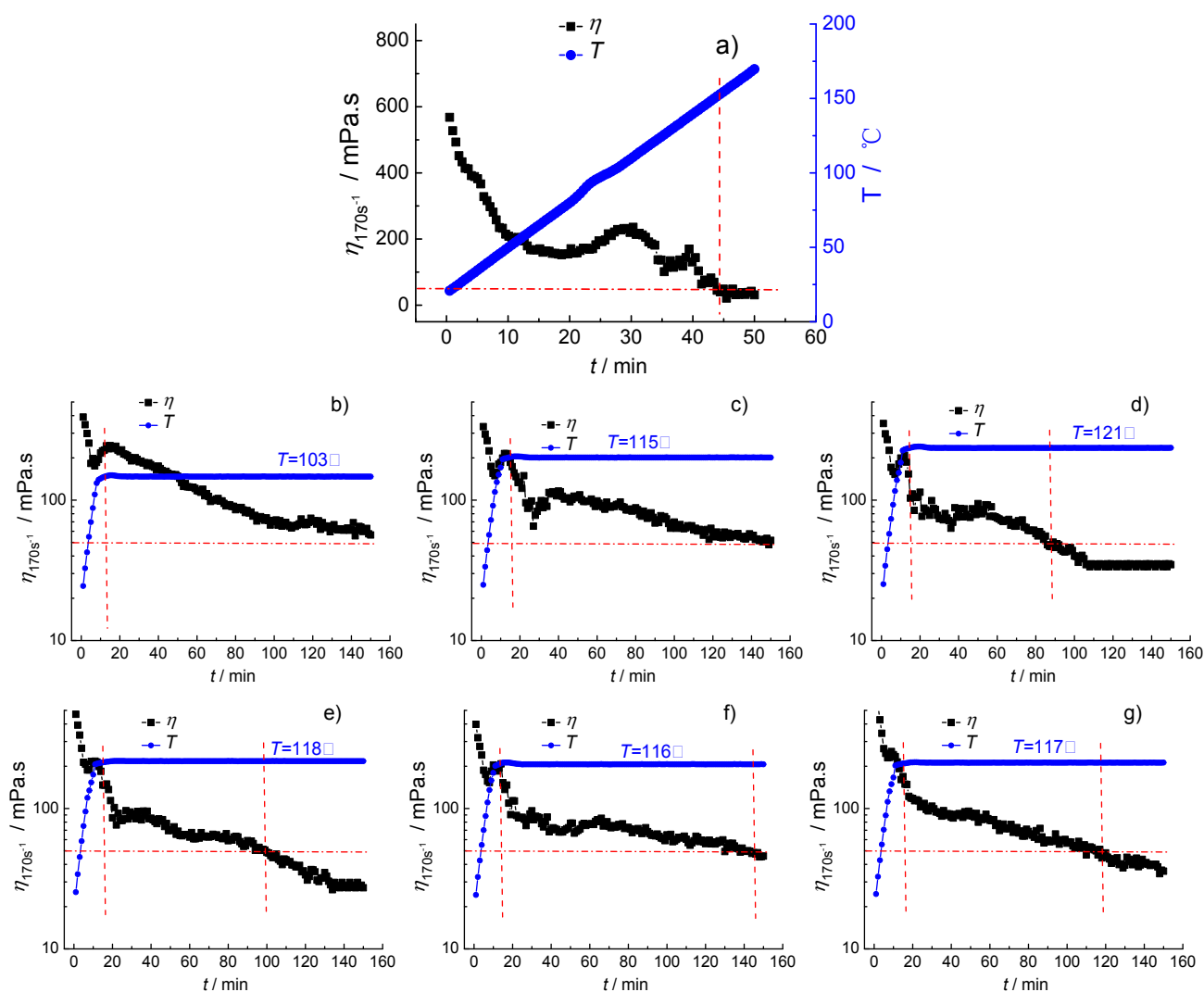


Fig.S24 The viscosity-temperature curve(a) and viscosity-time curves of the fracturing fluid at different temperature(b-g). The fracturing fluid is prepared by 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=13.

Tab.S24 The parameters $T_{\max}$, $t(T)$ and $T_{\max}(\eta_0, t_0)$ of the fracturing fluid. The fracturing fluid is prepared by 0.45wt.% HPG/0.8wt.% Na₂B₄O₇ cross-linked at pH=13.

Parameters	Experimental results
$T_{\max}$	150.8°C
$t(T)$	
$T=103^{\circ}\text{C}$	>138 min
$T=115^{\circ}\text{C}$	>137 min
$T=121^{\circ}\text{C}$	72 min
$T=118^{\circ}\text{C}$	83 min
$T=116^{\circ}\text{C}$	134 min
$T=117^{\circ}\text{C}$	99 min
$T_{\max}(\eta_0, t_0)$	116.5°C