

# Supporting Information

## Dispersion Stability of Graphene Oxide in Extreme Environment and its Applications in Shale Exploitation

Lan Ma<sup>1,2</sup>, Gang Xie<sup>\*1</sup>, Pingya Luo<sup>\*1</sup>, Liyun Zhang<sup>1, 3</sup>, Fan Yi<sup>4</sup>, Yi He<sup>1, 3</sup>

<sup>1</sup> State Key Lab of Oil and Gas Reservoir Geology and Exploitation, Southwest Petroleum University, 8

Xindu Avenue, Chengdu, Sichuan 610500, China

<sup>2</sup> School of Science, Xihua University, Jinzhou Road, Chengdu, Sichuan 610039, China

<sup>3</sup> College of Chemistry and Chemical Engineering, Southwest Petroleum University, 8 Xindu Avenue,

Chengdu, Sichuan 610500, China

<sup>4</sup> Chengdu Graphene Application Institute of Industrial Technology, Leshan Road, Chengdu, Sichuan 610500, China

**Email address of all authors:** [malan2018@emai.xhu.edu.cn](mailto:malan2018@emai.xhu.edu.cn) (Lan Ma), [201899010129@swpu.edu.cn](mailto:201899010129@swpu.edu.cn) (Gang Xie),

[luopy@swpu.edu.cn](mailto:luopy@swpu.edu.cn) (Pingya Luo), [1042924616@qq.com](mailto:1042924616@qq.com) (Liyun Zhang), [544760078@qq.com](mailto:544760078@qq.com) (Fan Yi),

[heyi@swpu.edu.cn](mailto:heyi@swpu.edu.cn) (Yi He).

**\* Corresponding author. Email address:** [201899010129@swpu.edu.cn](mailto:201899010129@swpu.edu.cn), [luopy@swpu.edu.cn](mailto:luopy@swpu.edu.cn)

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**Figure S1.** High-pressure and high-temperature filter instrument



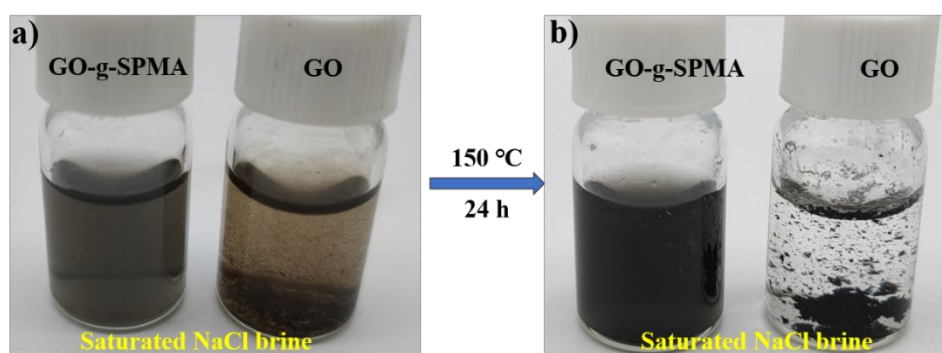
**Figure S2.** The digital photograph of LPFC

### 3 Results and discussion :

**Table S1** The atom composition of various modified graphene oxide

Sample	Element	Atom composition (%)
GO	C 1s	30.82
	O 1s	69.18
GO-APTES	C 1s	31.71
	O 1s	59.34
	Si 2p	4.26
	N 1s	4.70
	C 1s	37.48

GO-APTES-Br	O 1s	51.12
	Si 2p	2.49
	N 1s	4.39
	Br 3d	4.57
GO-g-SPMA	C 1s	32.39
	O 1s	48.19
	Si 2p	3.27
	K 2p	5.51
	S 2p	5.64
	N 1s	4.47
	Br 3d	0.52



**Figure S3.** The dispersion of GO and GO-g-SPMA preprocessed at high salinity and at high temperature.

The plugging performance of GO and GO-g-SPMA for the artificial core at the temperature of 105 °C and a pressure differential of 3.5 MPa depicted in Table S2. The total of the reverse blocking rate and the reservoir damage recovery rate is 100%. In Table S2, the plugging rate of 0.1 wt% GO-g-SPMA and 0.2 wt% GO-g-SPMA to artificial cores were 77.22% and 79.87% respectively, which were lower than that of 0.1 wt% GO (88.34 %). As for an artificial core, the reservoir damage recovery rate of 0.1 wt% GO-g-SPMA solution was 30.30 %, which was much higher than that of GO. With adding 0.3 wt% of GO-g-SPMA, the blocking rate and the reverse blocking rate of GO-g-SPMA increased to 96.02% and 96.78 %, respectively, whereas the reservoir damage recovery

rate was only 3.22 %. The results indicated that 0.3 wt% GO-g-SPMA had an outstanding plugging performance.

**Table S2** Evaluation of the plugging effect of GO and GO-g-SPMA artificial core at 105 °C

Substance addition	Blank core permeabil ity /mD	Forward drive permeability /mD	Permeability of reverse drive /mD	Blocki ng rate /%	Reverse blocking rate /%	Reservoir damage recovery rate /%
0.1wt% GO	$5.72 \times 10^{-2}$	$6.67 \times 10^{-3}$	$1.14 \times 10^{-2}$	88.34	80.07	19.93
0.1wt% GO-g-SPMA	$8.12 \times 10^{-2}$	$8.15 \times 10^{-2}$	$2.46 \times 10^{-2}$	77.22	69.70	30.30
0.2 wt% GO-g-SPMA	$7.85 \times 10^{-2}$	$1.58 \times 10^{-2}$	$9.37 \times 10^{-3}$	79.87	88.06	11.94
0.3 wt% GO-g-SPMA	$9.25 \times 10^{-2}$	$3.68 \times 10^{-3}$	$2.98 \times 10^{-3}$	96.02	96.78	3.22