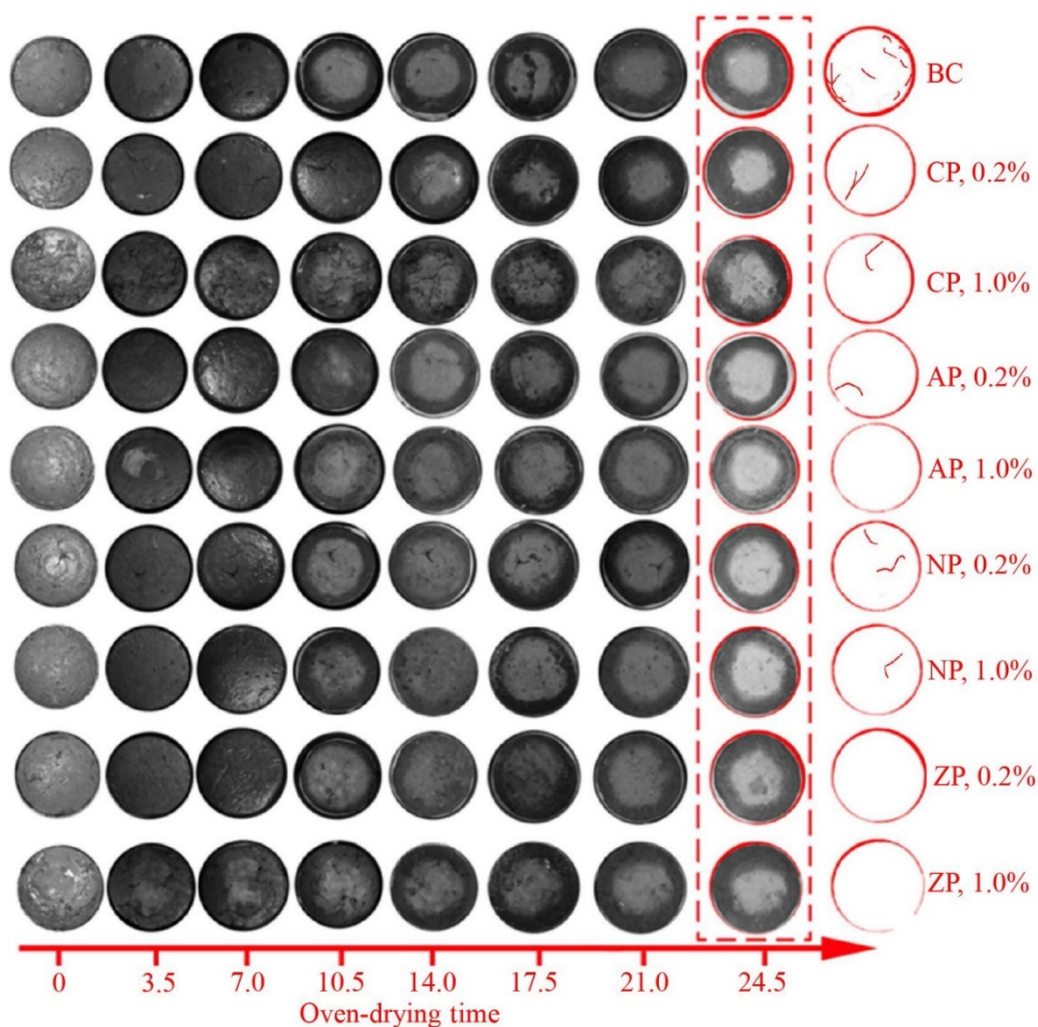


**Table S1** The results of each sample

Num	Code	W	$G_s$	$W_L$	$W_P$	$\rho_{dmax}$	wopt
		%		%	%	g/cm <sup>3</sup>	%
1	T-1	20.6	2.72	36	19.4	/	/
2	T-2	22.7	2.72	35.4	19.3	/	/
3	T-3	24.3	2.71	36	18.8	/	/
4	T-4	23.3	2.72	35.5	19.6	/	/
5	T-5	24.5	2.73	36.3	20.2	/	/
6	T-6	24.7	2.72	36	19.4	/	/
7	T-7	21.2	2.73	35.4	19.3	/	/
8	T-8	24.7	2.73	34	20.7	/	/
9	T-9	23.5	2.73	36	19.8	/	/
10	T-10	22.9	2.72	35.7	19.9	/	/
11	T-11	21.6	2.73	36.8	19.3	/	/
12	T-12	22.7	2.73	32	19.7	/	/
13	T-13	23.2	2.73	33.4	20.3	/	/
14	T-14	23.1	2.72	32	19.7	/	/
15	T-15	20.3	2.73	34.1	20.3	/	/
16	T-16	20.4	2.73	35.4	20	/	/
17	T-17	25.7	2.72	32.2	19.8	/	/
18	T-18	21	2.72	36.6	19.8	/	/
19	T-19	20.6	2.72	32	19.6	/	/
20	T-20	20.8	2.72	36.5	19.6	/	/
21	T-21	24.2	2.73	35.1	20.6	/	/
22	T-22	23.4	2.72	35.7	20.2	/	/
23	T-23	21.6	2.73	36	19.7	/	/
24	T-24	20.9	2.72	33.7	20.2	/	/
25	T-25	22.9	2.72	36	19.6	/	/
26	J-1	20.6	2.72	36.3	19.7	/	/
27	J-2	21.8	2.73	32.8	19.6	/	/
28	J-3	21.4	2.72	35.3	20.2	/	/
29	J-4	22.1	2.73	36.2	19.8	/	/
30	J-5	20.3	2.73	37	19.6	/	/
31	J-6	24.1	2.73	36.8	19.3	/	/
32	J-7	21.6	2.72	36.5	20.7	/	/
33	J-8	22.3	2.71	37	19.9	/	/
34	J-9	24.3	2.73	33.6	20	/	/
35	J-10	22.6	2.71	35.9	19.4	/	/
36	J-11	24.1	2.72	35.7	19.8	/	/
37	J-12	23.8	2.73	35.6	20	/	/
38	J-13	22.2	2.73	34.6	20.7	/	/
39	J-14	21.8	2.73	34.5	21.2	/	/

Num	Code	W	$G_s$	$W_L$	$W_P$	$\rho_{dmax}$	wopt
		%		%	%	g/cm <sup>3</sup>	%
40	J-15	23.6	2.73	33.8	19.9	/	/
41	T-13	/	/	/	/	1.78	15.8
42	T-20	/	/	/	/	1.78	15.5
43	T-24	/	/	/	/	1.79	15.6
44	T-25	/	/	/	/	1.78	15.2
45	J-9	/	/	/	/	1.77	15.8
46	J-10	/	/	/	/	1.78	15.6

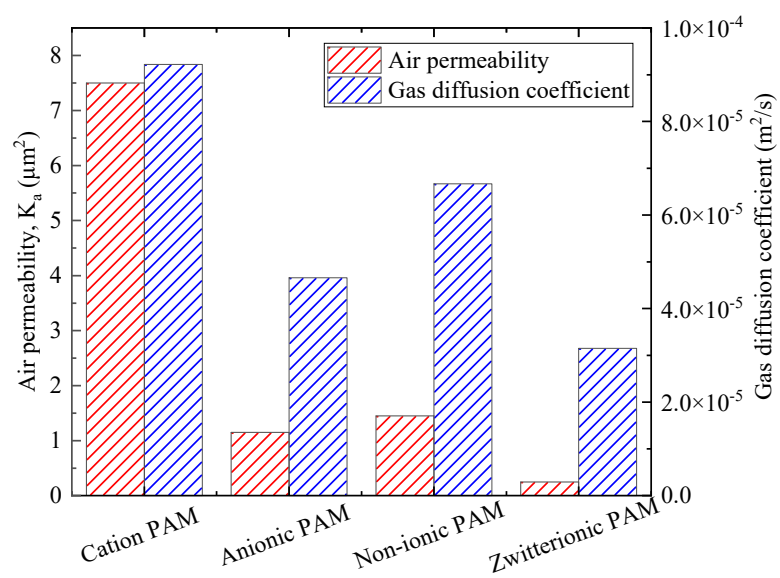
There are four kinds of PAM in the market: Cation PAM(CP), Anion PAM(AP), Nonionic PAM(NP), and Zwitterion PAM(ZP). According to the author's preliminary test results (see Figure S1), the zwitterionic PAM has the best effect inhibiting clay cracking.



**Note:** BC-Blank Control, CP-Cation PAM, AP-Anion PAM, NP-Nonionic PAM, ZP-Zwitterion PAM

**Figure S1.** Clay cracking with different PAMs.

Figure S2 shows that the modified clay (with 1.0% PAM content) had a much smaller gas permeability  $K_p$  and gas diffusion coefficient  $D_p$  with good gas barrier performance than that modified by cationic, anionic, and non-ionic polyacrylamide.



**Figure S2.** Gas permeability and gas diffusion coefficient of clay under different PAMs.