Supplementary Material

Acid-responsive MSN@RBA enhanced coating wound healing through alerting and releasing repairing agents

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In order to study the effects of different amounts of mesoporous silica (MSN) (0.04 g, 0.08g, 0.12g, 0.16 g) on the passivation performance of PropS-SH coating, the pyrite electrodes coated with pure silane coating and composite passivation coating (PSMN) were tested by electrochemical and chemical leaching experiments. The optimal addition amount of MSN is obtained.

Text S1. Electrochemical tests

In 0.2M Na_2SO_4 electrolyte with pH 2.0, Nyquist curves and Tafel polarization curves of different pyrite electrodes are shown in Fig. S1 and S2. All EIS data are fitted using the equivalent circuit $R_s(Q_1(R_{ct}(Q_2R_f))$, and the meaning of each parameter in the formula has been explained in the manuscript. As can be seen from Table S1, both R_{ct} and R_f values increase after the addition of MSN, which improves the passivation performance of the coating. Among them, the R_{ct} and R_f values of PSMN-0.12

composite passivation agent coating are the highest, indicating that the coating has a better antioxidant ability when the addition of pure MSN is 0.12g.

The polarization parameters such as corrosion potential (E_{corr}) and corrosion current density (J_{corr}) of these electrodes can be obtained by extrapolating from the Tafel curve.As can be seen from Table S2,E_{corr} :PSMN-0.12 > PSMN-0.16 > PSMN-0.08 > PSMN-0.04 > PS > Raw pyrite;J_{corr}:PSMN-0.12 < PSMN-0.08 < PSMN-0.04 < PSMN-0.16 < PS < Raw pyrite.The PSMN-0.12 composite passivator coating has the highest E_{corr} and the lowest J_{corr}, indicating that the electrode has the best oxidation resistance. The electrochemical test shows that PSMN-0.12 composite passivator has the best anticorrosive effect.

Text S2. Chemical oxidation resistance test

In order to further verify the electrochemical test results, chemical leaching experiments of different pyrite samples were carried out using HCl solution with pH 1.0. The experimental results are shown in Fig. S3 and S4. After 24h, the pyrite coated with PropS-SH, PSMN-0.04, PSMN-0.08, PSMN-0.12 and PSMN-0.16 is compared with the untreated pyrite,The passivation rates of total Fe and SO_4^{2-} were 45.37%, 53.05%, 63.38%, 81.26%, 75.89% and 36.90%, 41.57%, 49.16%, 60.48% and 56.93%, respectively. Therefore, the addition of MSN to the PropS-SH passivator can significantly enhance the oxidation resistance of PS passivator films, in which PSMN-0.12 composite passivator has the strongest passivator performance. The results are consistent with the electrochemical tests.

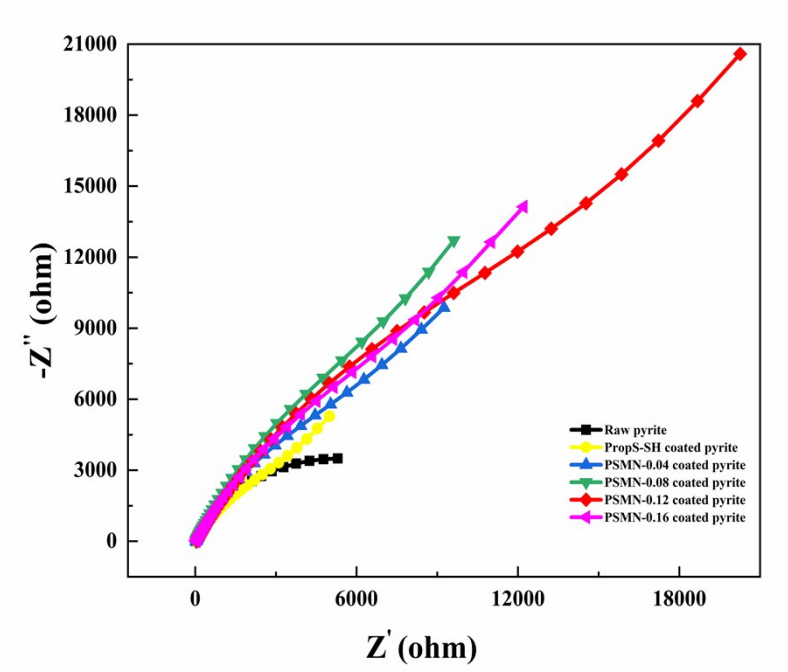

Fig. S1. Nyquist plots of Electrochemical impedance spectroscopy data for different pyrite electrodes in 0.2 M Na_2SO_4 solution with pH 2.0.

Table S1. Equivalent circuit diagram parameters ofdifferent pyrite electrodes.

Electrodes	R_s /Ω cm^2	Q_1 $Y_1/10^{-4}$ S / s^n cm^{-2}	n	R_{ct} /Ω cm^2 /10^4	Q_2 $Y_2/10^{-4}$ S / s^n cm^{-2}	n	R_f /Ω cm^2 /10^4
Raw pyrite	30.9	1.14	0.7	0.001	0.23	0.9	1.10
PropS-SH coated pyrite	27.7	1.08	0.72	1.03	2.01	0.91	2.76
PSMN-0.04 coated pyrite	27.4	0.55	0.76	1.65	1.11	0.83	6.54
PSMN-0.08 coated pyrite	28.1	0.59	0.76	3.11	0.84	1	7.94
PSMN-0.12 coated pyrite	67.3	0.25	0.71	3.9	0.54	0.89	16
PSMN-0.16 coated pyrite	31.2	0.46	0.72	3	0.7	0.99	5.78

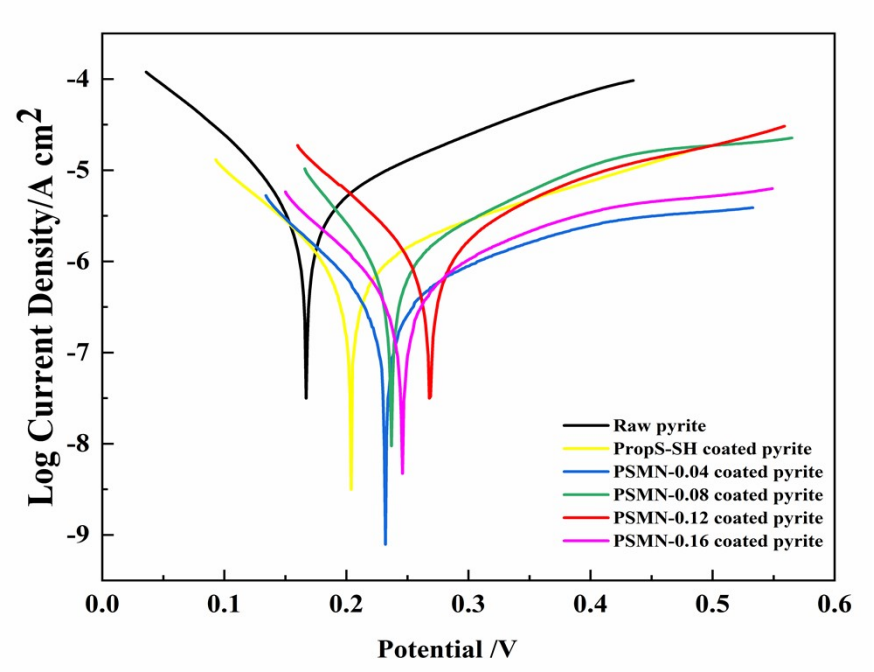

Fig. S2. Tafel polarization curves of different pyrite electrodes in 0.2 M Na_2SO_4 solution with pH 2.0.

Table S2. Tafel polarization kinetic parameters ofdifferent pyrite electrodes.

Electrodes	E_{corr} (mV / SCE)	J_{corr} (μA cm^{-2})
Raw pyrite	167	4.59
PropS-SH coated pyrite	204	1.01
PSMN-0.04 coated pyrite	232	0.40
PSMN-0.08 coated pyrite	237	0.37
PSMN-0.12 coated pyrite	268	0.30
PSMN-0.16 coated pyrite	249	0.52

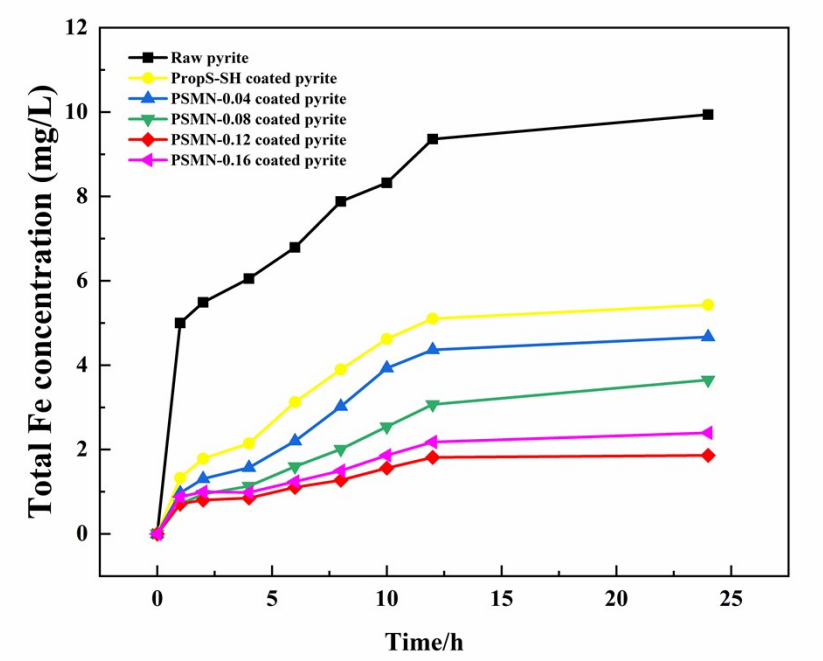

Fig. S3. Leached concentrations of total Fe over a 24-hour chemical leaching experiment.

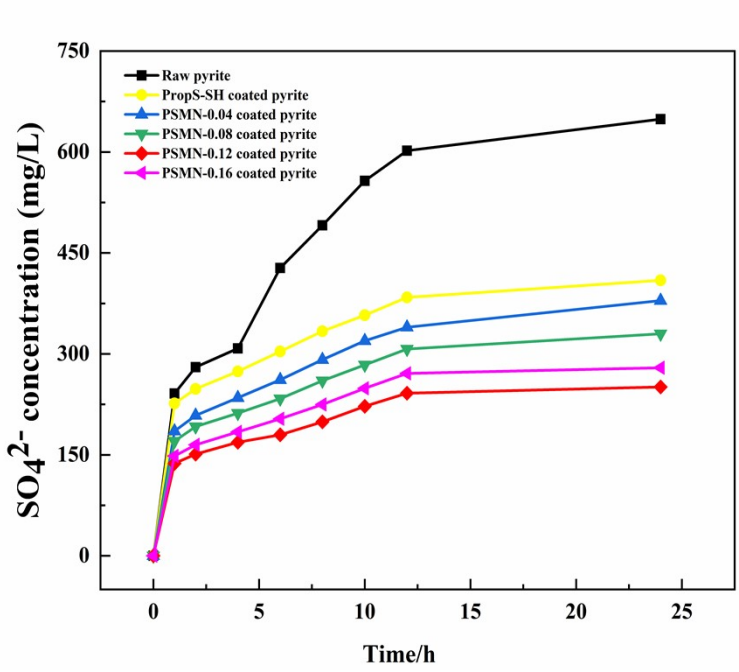

Fig. S4. Leached concentrations of total SO_4^{2-} over a 24-hour chemical leaching experiment