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An Eco-Friendly High-Effective Scale Inhibitor for High Salt Brine

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Now the mining of high salt underground brine has been an important aspect of salt lake mining, which is the necessary support to the development of national economy. With the change of underground geological conditions and the temperature and pressure in the mining process, the component of high salt brine would appear different crystallizing and scaling phenomenon. The scale reduces the pipeline effective volume and increases the pipe resistance, which not only leads to the decline of production but also restricts the exploitation and sustainable utilization of brine. In this article, new type green scale inhibitor poly epoxy succinic acid (PESA), poly aspartic acid (PASP) and good salt resistance surfactant sodium lignin sulfonate, sodium dodecyl sulfate, fatty alcohol-poly oxy ethylene ether AEO-9 and nonylphenol poly oxy ethylene ether TX-10 were studied. Through the comparative study of scale inhibition effect, the poly epoxy succinic acid (PESA) and sodium lignin sulfonate were selected as the mixed monomer. Results indicated that these two monomers have synergistic effect in the anti-scaling of high salt brine. With a certain method, these two monomers were mixed and formed a new scale inhibitor called PL-1. The results showed that when the PESA comprised about 60%, the combined system had a good scale inhibition performance of high salt brine. When the dosage of PL-1 was 35mg/L, inhibition rate of PL-1 on sodium, calcium, barium, strontium contained in the high salt brine all reached above 90%. PL-1 could also eliminate the emission of nitrogen and phosphorus. Meanwhile, the PL-1 which can be easily biodegraded has a good temperature and salt resistance. Even when the temperature reached 100°C and the degree of mineralization reached 400g/L, the inhibition rate could also reach above 90%. As a result, PL-1 is a good scale inhibitor which solves the problem of the pipe scaling in the process of brine mining and has good popularization and application values.

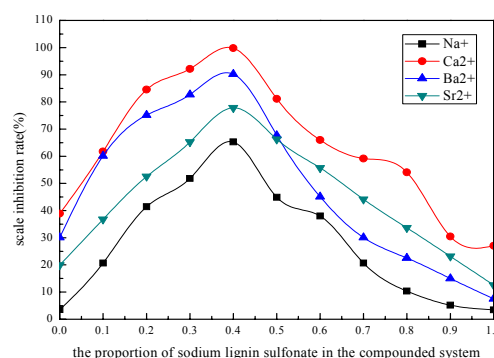


Fig. 1. the scale inhibition rate under different proportion of sodium lignin sulfonate.

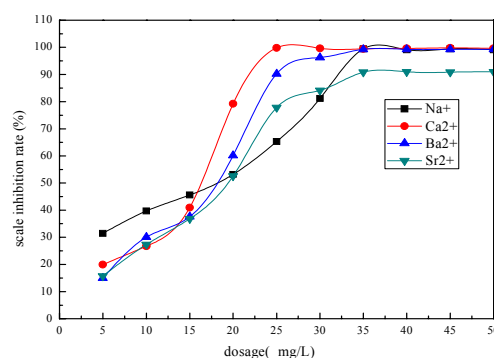


Fig. 2. the scale inhibition rate under different dosage of PL-1.

Table 1 The inhibition rate of each monomer and PL-1 of the high salt brine when the temperature is 80°C and the dosage is 25mg/L

Scale inhibitor	Na ⁺	Ca ²⁺	Ba ²⁺	Sr ²⁺
PESA	3.45%	38.90%	30.07%	19.98%
sodium lignin sulfonate	3.65%	23.68%	7.52%	12.62%
PL-1	65.25%	99.79%	90.23%	77.81%

Key words: high salt brine, poly epoxy succinic acid (PESA), sodium lignin sulfonate, scale inhibition rate.

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