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Solubility and scale prevention of gypsum in transportation pipes of well brine with salinities up to 5 M at temperature range of 278–298 K

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ABSTRACT

The results of work performed on reducing gypsum scale formation in transportation pipes of well salt brine are described. Two methods: seeding with calcium sulfate dihydrate and dilution of brine were proposed. With the first method, various mass and size distributions of seeds were introduced into an perspex reactor with well salt brine (NaCl: 300 g/L, Na2SO4: 20 g/L) to investigate the factors that influence crystallization of calcium sulfate dihydrate, such as temperature, mass of seed crystals, and size distribution of seed crystals. The kinetics of calcium sulfate dihydrate growth at temperatures ranging between 5 and 25°C were obtained. Results showed that the elimination of supersaturation was enhanced with increasing temperature and the dosage of seed crystal. It was also found that the more efficient in scale prevention was obtained when smaller seed crystals were employed. It was seen that the crystal growth of calcium sulfate dihydrate in brine was proportional to the square of supersaturation at the investigated temperatures. With the second method, results showed that a complete elimination of supersaturation was achieved when 4.3% water was added into the brine with the help of solubility determination of calcium sulfate dihydrate.

Keywords: Scale prevention; Well brine; Calcium sulfate dehydrate; Supersaturation; Seeded crystal growth

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