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Jet atomization of brine to achieve zero liquid discharge[1] CHRISTIAN MACHADO, YOUHUA JIANG, KYOO-CHUL PARK, Northwestern University — Achieving zero liquid discharge in brine management facilities is critical to solving the environmental problems associated with returning high salinity water to its source. One such pathway for reducing the amount of discharged brine is by utilizing evaporation. To accelerate the evaporation of water in brine, the bulk brine solution should be atomized into microdroplets (i.e., fog) using a high pressure flow. In this study, brine with systematically varying concentrations of salt (NaCl) and surfactant (cetrimonium bromide (CTAB)) was atomized at different compressed air pressures. Results show that the rate of fog droplet generation decreases with increasing salinity. To combat this effect, adding a low surface tension surfactant and increasing compressed air pressure have shown to improve the rate of atomization. Quantitative data analysis was performed to understand the effects of the brine's physico-chemical properties, such as density, surface tension, and viscosity, as well as external variables such as compressed air pressure on overall droplet generation. This study introduces a new approach of brine evaporation using recovered thermal energy, and provides insights in jet atomization.

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