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Fundamental study on preventing crevice corrosion in the flanges of salt manufacturing plants by using pure water penetration

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Summary

Crevice corrosion occurs when the chloride-ion concentration of the solution existing inside the crevice exceeds a critical level and the material's surface inside the crack is depassivated. Thus, if pure-water is made to penetrate into the crevice and the chloride-ion concentration is kept below the critical levels, the occurrence of crevice corrosion might be prevented or, at least its activity would be mitigated. In this study, it was examined whether this pure-water penetration technique is applicable to preventing crevice corrosion in the flange of salt manufacturing plants.

SUS 316L stainless steel was used for the material of the crevice specimen. A paper-filter gasket was sandwiched between the specimen and a Teflon plate, and they were tightened by 10 Nm torque. A simulated brine-water in salt manufacturing process was used for test solution. The solution temperature was controlled at 70℃. The degree of crevice corrosion susceptibility was evaluated by comparing the repassivation potential of corrosion crevice, which were measured following the method standardized as JIS G-0592.

Fig. 1 shows changes in $E_{R,CREV}$ with stages at which the water penetrations were started. The change with feed-in pressure of water and the $E_{R,CREV}$ when the water penetrations was not applied were also measured. As shown in the figure, the $E_{R,CREV}$ rose when the water penetration began from Stage (1) or (2). The stage (1) was a moment that the $E_{R,CREV}$ measurement was started. The stage (2) was that the growth of crevice corrosion was initiated. Especially, the improvement of $E_{R,CREV}$ of 100 mV was seen when it began from Stage (2). This result shows that there is a possibility that the crevice corrosion is mitigated by applying the pure water penetration technique.

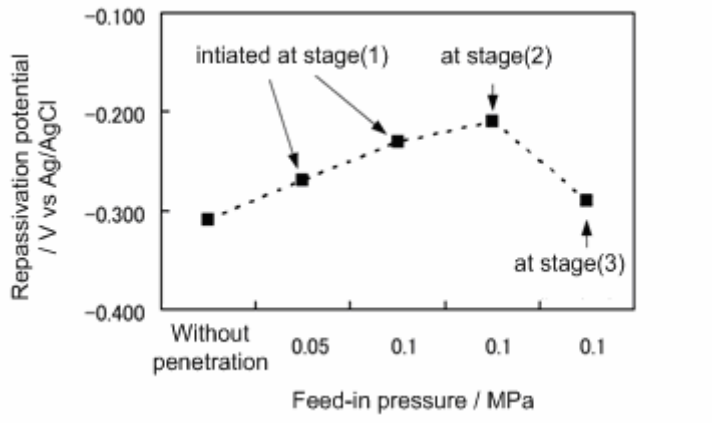

Fig. 1 $E_{R,CREV}$ measured under the various experimental conditions