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Application of Potential Noise Method to the Selection of Material Used in Salt-Manufacturing Environment

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Summary

A new technique that would accelerate the time for the test to evaluate the localized corrosion susceptibility of stainless steels was developed. The potential noise method is capable of detecting the initiation of the pits and cracks at the earliest period of their growth where their dimensions are less than several ten microns. Therefore, there is a possibility to greatly accelerate the test time, comparing to the conventional techniques that evaluate the susceptibility by comparing the period until the macroscopic pits and cracks being initiated. In this study, it was confirmed that the generation frequency of potential noise is remarkably affected with differences in the way of surface finish or the sulfur content, which are known as variables greatly affecting the localized corrosion susceptibility of materials.

SUS304, SUS303, SUS316, and SUS444 stainless steel were used for the testing materials. A 0.6 M NaCl at 333K was used for the test solution. A slow straining of 1.7×10^{-7} /s was added to the specimens. The potential noise was obtained by continuously measuring the corrosion potential of the specimens at 0.5 s intervals, with a digital voltmeter of which accuracy was 10 μ V.

Fig. 1 is an example that shows the potential noise being capable of distinguishing the susceptibility of the material, sensitively. Because the scale of the time axis is being compressed, they look spike-like signals to less-noble direction, however, all of them superimposed on the steady corrosion potential are typical RD-type noises, which are known to be generated by the initiations of localized corrosion. The noise generation-frequency of the electropolished specimen, which is known to show a superior resistance against localized corrosion in chlorided solutions, is lower than that of the mechanically polished specimen.

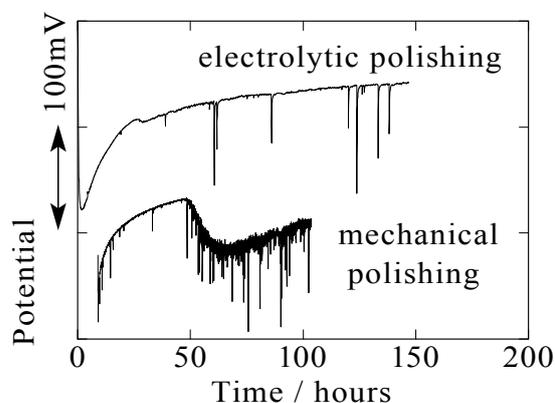


Fig. 1 Potential noises of the electrolytic polished and the mechanically polished specimens in 0.6 M NaCl (333K) solution.