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Susceptibility Mapping and Mechanistic Understanding of Stress Corrosion Cracking for Austenitic Alloys

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Summary

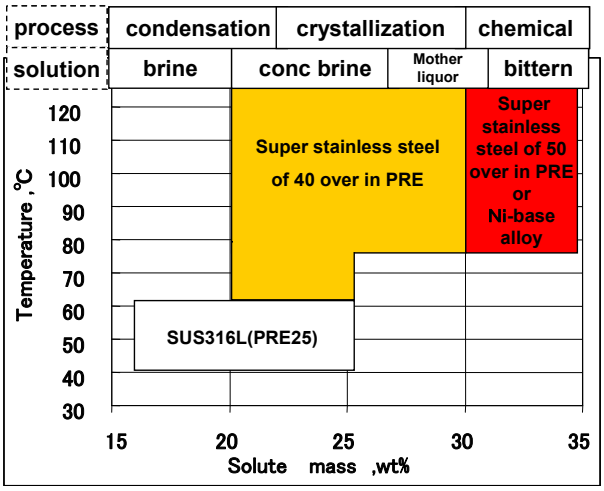
To manage stress corrosion cracking (SCC) of structual materials in salt production plants, avoiding initiation of SCC by selections of suitable alloys and optimized operating conditions are important, since propagation rate of SCC is very high, once the cracking started. Hence, this study aims to construct "SCC susceptibility maps", which indicates the critical conditions of SCC for austenitic alloys to occur in the environments of salt production plants.

Constant strain SCC tests has been done for five kinds of austenitic alloys, SUS316L, YUS270, NAS254N, NAS354N, and C-22. The testing conditions were in conc brine, mother liquor, bittern and the temperatures were 60 - 110°C. SCC susceptibility maps of the alloys in the salt production environments have been constructed based on the tests. Material selection guideline has been determined based on both the test results and reported SCC experiences in actual plants.

Applicabilities of the alloys in the salt production environments are following;

- It is reasonable to apply SUS316L to condensation process.
- It is necessary to apply at least super stainless steels of 40 over in PRE to crystallization process and later.
- If it is necessary to avoid all local corrosion in chemical process, super stainless steels of 50 over in PRE or Ni-base alloys should be applied.

(Pitting Resistance Equivalent: PRE = Cr + 3.3Mo + 20N)



Material selection guideline in salt production plant