Tellurium-induced corrosion and cracking behavior of GH3535 alloy in molten FLiNaK salt

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Abstract During the operation of molten salt reactors, alloys exposed to the fuel salt are vulnerable to fission product tellurium-induced corrosion and cracking[1]. This type of corrosion is found to be sensitive to Te content and the redox potential of the fuel salt, hence is not easily simulated in the laboratory experiment[2,3]. In this stduy, corrosion tests of GH3535 alloy in non-radioactive molten FLiNaK salts, with Cr_3Te_4 as tellurium source and different EuF_3 additions to adjust the salt redox potential, were carried out at 700°C. The result show that samples exposed to Cr_3Te_4 added salts all exhibited intergranular corrosion and cracking, and cracking severity were enhanced with increasing EuF_3 concentration from 0 to 3wt.%, although Te contents in all these samples were below the detection limitation of EPMA. On contrary, the control samples exposed to the salt with only 3wt.% EuF_3 addition show less obvious intergranular corrosion and no cracking. The synergistic effect between EuF_3 and Cr_3Te_4 promoted the grain boundary Te segregation and Cr depletion, hence caused severer intergranular cracking. Present experiment design may serve as a readily surrogate approach for future Te corrosion studies.

Keywords Molten salt，Fission product，Nickel-based alloy

Reference

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