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Chemical compatibility with liquid sodium after in service solicitations: feedback on stainless steel in French sodium Fast reactor after 35 years of operation

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French fast breeder nuclear plant PHENIX was definitively shut down in 2009. The dismantling preparations operations of some of PHENIX components are underway. Since 2008, CEA, EDF and AREVA have identified more than twenty relevant components of PHENIX, to get the most from the feedback of the components behavior.

Feedback regarding PHENIX components materials like austenitic stainless steels is large and valuable because some service solicitations of base metal or welds are difficult to reproduce in laboratory.

In 2012, first examination have been performed on a rod made of SS 304L and SS 316L grades and exposed for about 70 000h to sodium at high temperature.

In this paper, we proposed to highlight the chemical compatibility with liquid sodium of the rod materials and compare it with the state of art on corrosion of austenitic SS (for structural components) in liquid sodium. Examinations (SEM, EDX, WDS) of the rod from PHENIX are the opportunity to improve the overall understanding of the coolant chemistry and its interactions with the materials, enabling easier operation of such reactor.

Finally, relevant data are obtained from this feedback for corrosion modeling for ASTRID fast reactor.

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