UNDERSTANDING OF THE HYDROGEN EMBRITTLEMENT MECHANISMS OF NICKEL BASE ALLOYS: A REVIEW OF SOME RECENT ADVANCES ON INTERGRANULAR FRACTURE

Abdelali Oudriss, La Rochelle University, LaSIE CNRS UMR 7356, Av. Michel Crépeau 17000, La Rochelle, France
abdelali.oudriss@univ-lr.fr
Marie Landeiro Dos Reis, La Rochelle University, LaSIE CNRS UMR 7356, Av. Michel Crépeau 17000, La Rochelle, France
Jamaa Bouhattate, La Rochelle University, LaSIE CNRS UMR 7356, Av. Michel Crépeau 17000, La Rochelle, France
Xavier Feaugas, LaSIE CNRS UMR 7356, Av. Michel Crépeau 17000, La Rochelle, France

In order to provide elements of understanding to the mechanisms of hydrogen embrittlement (HE) of nickel base alloys, some implications of elasticity on hydrogen-defects interactions under tensile loading were questioned in relation with microstructural features (crystal orientation, grain-boundary, precipitation, etc.). Several investigations were conducted to evaluate the hydrogen-defects interactions and their consequences on the diffusion and trapping process, and on the mechanisms of fracture assisted by hydrogen. These investigations were based on several experimental and numerical approaches such as atomistic calculations, nano-indentation and electrochemistry pulse techniques and applied on nickel single crystals, nickel bicrystals, nickel polycrystals, Inconel 718 additively manufactured and Waspaloy alloys. Based on Beremin's fracture model, the impact of hydrogen on intergranular mechanism is discussed in relation with the metallurgical state.