Effects of Hydrogen on Fatigue Properties of Ni-Cr-Mo Steel Candidate for a 80 MPa Storage Cylinder of a Hydrogen Filling Station

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Experiments to investigate the effect of hydrogen pressure, p, and loading frequency, f, on JIS-SNCM439 for the storage cylinder of a 70 MPa hydrogen storage station were conducted, with the conditions being p = 0.6 ~ 90 MPa and f = 0.01 ~ 5 Hz. The results obtained in hydrogen gas, specifically the crack growth rate, were compared with data obtained in air. They show that higher hydrogen pressures and lower loading frequencies, typically at p = 90 MPa and $f \leq 0.1$ Hz, lead to faster crack growth, with a crack growth acceleration factor up to 86. These findings mean that there is an upper limit for the acceleration of the crack growth rate in 90 MPa hydrogen gas. In 0.7 MPa hydrogen gas, crack growth acceleration was lower at frequencies lower than 1 Hz, with the maximum acceleration factor of 5.6, that is there is an upper limit around 1 Hz.