

Perilaku korosi retak tegang stainless steel 304 dalam lingkungan asam sulfat akibat prestrain

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Abstrak

Tujuan penelitian ini adalah untuk mengetahui pengaruh prestrain terhadap perilaku korosi retak tegang stainless steel AISI 304 dalam larutan H₂SO₄ konsentrasi 10% dengan pembebanan kantilever statis (ASTM E-1681). Prestrain dilakukan dengan meregangkan spesimen hingga mencapai regangan merata 5% dan 10% diatas tegangan luluh bahan, menggunakan servopulser UTM 9506 dengan kontrol kecepatan 0,3 mm/sec.

Hasil pengujian menunjukkan bahwa spesimen dengan 5% prestrain lebih cepat mengalami kegagalan daripada spesimen 10% prestrain dan tanpa prestrain. Hal ini disebabkan menurunnya keuletan dan periode inkubasi yang singkat. Perubahan defleksi hanya dapat diamati pada pembebanan 20% tegangan luluh bahan. Retak intergranular ditemukan pada spesimen 10% prestrain pada pembebanan statis 616 MPa. Sedangkan pada spesimen 10% prestrain ditemukan retak transgranular pada pembebanan statis 554,4 MPa. Retak kombinasi ditemukan pada spesimen 5% prestrain pada pembebanan statis 369,6 MPa. Semakin tinggi densitas dislokasi pada lapisan permukaan akibat deformasi plastis, semakin sulit difusi hidrogen pada ujung retak. Konsekuensinya, periode inkubasi dapat diperlama.

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Stress Corrosion Cracking Behavior of Stainless Steel 304 in the Sulfuric Acid Environment Due to Prestrain. The aim of research is to investigate the effect of prestrain on the stress corrosion cracking behavior of AISI 304 stainless steel in the sulfuric acid of 10% concentration under the static cantilever loading according to ASTM E-1681 standart. The specimen of 304 Stainless steel was strain up over the yield strength until reaching the uniform strain of 5% and 10% using servopulser UTM 9506 under the displacement control of 0,3 mm/sec.

The results of test show that the prestrain of 5% specimen is faster failure than both of the prestrain of 10% and unprestrain specimen. It was caused by both of the decrease of ductility and the short incubation period. The change of deflection could be only recorded under the loading 20% of yield strength. Intergranular crack was the prestrain of 10% specimen under the static loading of 616 MPa. Whereas, for the prestrain of 10% specimen transgranular crack was found under the static loading of 554,4 MPa. The prestrain of 5% specimen was mixed crack under the static loading of 369.6 MPa. Higher dislocation density on the layer surface due to plastic deformation with increasing the percentage of pre-strain, so more difficult hydrogen diffused into the crack tip. Consequently, The incubation period can be prolonged.