

Comparative study of crack path evolution under bending fatigue strain of two corrosion resistant materials

Hamid Sedjal¹, Fatah Hellal²

¹Department of Mechanical Engineering, University of Mouloud Mammeri, Tizi Ouzou, Algeria, hasedjal@yahoo.fr

²Laboratoire de Science et Génie des Matériaux, Ecole Nationale Polytechnique, BP.182, El Harrach, Alger, Algérie fatah.hellal@enp.edu.dz

Abstract

The behavior of materials is often defined when they are in service. Several parameters, such as dynamic mechanical solicitations and working environment, are of importance. In some cases, materials are subjected to fatigue in due time under the influence of mechanical loads and the effect of medium. Aluminum alloys and stainless steel are two corrosion resistant materials which are used in navy, aeronautic and medical manufactures. To study the behavior of these materials on corrosion fatigue, we have carried specimens to air fatigue and in several medium at different stress frequencies.

For aluminium specimens, we observed a phenomenon of decohesion between grains called as exfoliation corrosion. This can be explained by the fact that the damages are concentrated with the notches, where there is a high stress concentration.

For 316L stainless steel, one can point out the linearity and the uniformity of this crack both on the surface and inside the. This can be related to the uniform shape of area on which is applied the load. A decreasing in the load frequency is accompanied by an increasing of the crack opening, over the whole fatigue test. For a same number of cycles, specimen is much longer solicited mechanically and exposed to the chemical medium, at low frequency than at the higher one. It's known that even if the amplitude of strain at the crack tip is not affected by the load frequency, it changes periodically with time.

1. Introduction

The behavior of materials is often defined when they are in service. Several parameters, such as dynamic mechanical solicitations and working environment, are of importance. In some cases, materials are subjected to fatigue in due time under the influence of mechanical loads and the effect of medium.

