Influence of the Microstructure on the Mechanical Properties of an AISI 304L Stainless Steel –A Comparison Between Bulk and Nanocrystalline Fibers

F.J. Baldenebro-Lopez[1, 2], C.D. Gómez-Esparza[1], J.E. Ledezma-Sillas[1] and J.M. Herrera-Ramírez[1]

[1]Departmento de Integridad y Diseño de Materiales Compuestos, Centro de Investigación en Materiales Avanzados (CIMAV), Laboratorio Nacional de Nanotecnología, Miguel de Cervantes 120, Chihuahua, Chih., México 31109
[2]Facultad de Ingeniería Mochis, Universidad Autónoma de Sinaloa, Prol. Ángel Flores y Fuente de Poseidón, S.N., Los Mochis, Sinaloa, México 81223

E-mail: martin.herrera@cimav.edu.mx

Abstract

The most popular type of austenitic stainless steel is the AISI 304L, which basically contains 18% chromium
and 8% nickel. Austenitic stainless steel has a193 GPatypicalatroomtemperatureYoung's. mod Annealed wire, which is commonly specified for sizes over 0.75 mm, in the 3*xx* series commonly has a tensile
strength of 655 to 860 MPa and an elongation (in 50 mm) of 35 to 60% [1]. Many metals in the form of wires show rather high strength levels. One great advantage of metallic wires is that they show very consistent strength values, more so than any of the ceramic fibers.

The application fields of stainless steel fibers are aircraft industry (within aluminum matrix), aerospace industry (along with boron, borsic and molybdenum fibers embedded in aluminum and titanium matrix), and within matrix of nickel alloys are used for rocket engines [2]. Steel fibers are obtained by successive wire bundle-drawings. Fracture of metallic filaments differs in many respects from fracture of bulk samples. Particular fabrication processes for fibers may introduce specific defects and textures, and have influence on the fracture behavior [3].

In the present work, the mechanical properties and microstructural features of an AISI 304L stainless steel in two presentations, fibers and bulk, were systematically investigated in order to establish the relationship microstructure-mechanical properties,

fabrication process and effect on size. The microstructure was analyzed by XRD, SEM and TEM. The strength, Young´s modulus and elongation of the fibers and bulk 304L austenitic stainless steel were determined by tensile tests, while the hardness was measured by nanoindentation and Vickers microhardness.

Keywords

AISI 304L stainless steel, bulk material, single fibers, tensile tests, mechanical properties.

References

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