

The High Strength Biocompatible Wires of Commercially Pure Titanium

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Abstract : COMTES FHT has been active in a field of research and development of high-strength wires for quite some time. The main material was pure titanium. The primary goal of this effort is to develop a continuous production process for ultrafine and nanostructured materials with the aid of severe plastic deformation (SPD). This article outlines mechanical and microstructural properties of the materials and the options available for testing the components made of these materials. Ti Grade 2 and Grade 4 wires are the key products of interest. Ti Grade 2 with ultrafine to nano-sized grain shows ultimate strength of up to 1050 MPa. Ti Grade 4 reaches ultimate strengths of up to 1250 MPa. These values are twice or three times as higher as those found in the unprocessed material. For those fields of medicine where implantable metallic materials are used, bulk ultrafine to nanostructured titanium is available. It is manufactured by SPD techniques. These processes leave the chemical properties of the initial material unchanged but markedly improve its final mechanical properties, in particular, the strength. Ultrafine to nanostructured titanium retains all the significant and, from the biological viewpoint, desirable properties that are important for its use in medicine, i.e. those properties which made pure titanium the preferred material also for dental implants.

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