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Functional fe-base biodegradable materials for medical applications

Cimpoesu N

Technical University Gheorghe Asachi of Iasi, Romania

Iron represent the main source of metal applications worldwide based on consumption of steel and cast iron. After the success of stainless steels used in medical field the world is expected to use new materials with special properties in order to treat specific medical problems. With a certain chemical composition Fe-based alloys can fulfill two main functions in the same time: shape memory effect and biodegradability that can be used in medical applications. Shape memory alloys (SMAs) have been analyzed intensively over the last years by different point of view (shape memory effect, superelasticity or damping capacity) by several research teams. Biodegradable metal alloys (Mg, Fe and Zn based) have recently reached an important scientific and medical interest for applications as implant materials in cardiovascular and in orthopedic surgery. Biodegradable materials used in implantology must meet, in addition to the general requirements for an implantable material, two main functions for applications: the first is to provide the mechanical stability of the recovered element during the first part of the healing period and the second of the gradual degradation in a certain period of time. The first function can be provided

by coating the biodegradable element with one or more biocompatible thin layers to ensure the integrity of the material for a precise-established period of time. The second function can be accomplished by introducing micro-alloying elements in Fe-based alloy as small quantities in the form of micro- or nano- particles to stimulate and generalize degradation of the material in contact with an electrolyte solution. We choose for thin coatings, materials based on ceramics (HA, HA+ZrO₂ and HA+Ag) and Mg, Ca or Zn as micro-alloying elements. Part of this research was funded by a research grant of TUIASI, project number 1420/2018: Design and characterization of a multifunctional element with memory effect for medical applications, code TUIASI-GI-2018 - PN-III-P1-1.1- TE-2016-1420.

Speaker Biography

Cimpoesu N has completed his PhD at the age of 30 years from Gh. Asachi Technical University of Iasi, Romania, in the field of damping capacity of shape memory alloys. He is the coordinator of Microscopy Laboratory (optical microscopy, scanning electron microscopy and atomic force microscopy), assoc. prof. at Gh. Asachi Technical University, Romania. He has over 85 ISI publications that have been cited over 450 times, and his publication H-index is 12.

e: nicanorcimpoesu@gmail.com



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