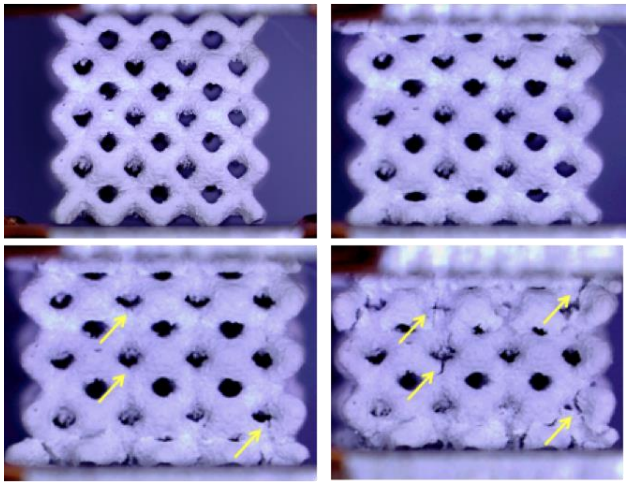
KTH SOLID MECHANICS KEYNOTE SEMINAR; Thursday, November 10th, 16.15; https://kth-se.zoom.us/j/68949537026

Javier LLorca

"3D printed multimaterial bioabsorbable scaffolds for bone tissue engineering: mechanical, corrosion and biological performance"

Temporary implants and scaffolds from bioabsorbable materials, that are progressively degraded and absorbed in the human body have tremendous potential for tissue engineering applications. Moreover, 3D printing technologies allow to design implants and scaffolds that are customized to the patient's needs. However, the full potential of bioresorbable scaffolds can only be achieved if it is possible to develop materials in which the mechanical properties and degradation rates are synchronized with tissue growth. To this end, it is necessary to develop a palette of biodegradable materials which cover a wide range of mechanical properties and degradation rates. In this talk, strategies to design different bioabsorbable materials (metals, polymers and metal/polymer composites) and surface modifications to tailor mechanical properties, degradation rates and biocompatibility for bone tissue engineering are presented. They include Mg scaffolds manufactured by laser power-bed fusion as well as composite scaffolds made up of a biodegradable thermoplastic matrices reinforced with Mg or Zn particles or Mg fibers manufactured by fused filament fabrication. Moreover, surface modifications are used to control the degradation rate and improve cytocompatibility while advanced simulation tools are used to predict the degradation of the mechanical performance of the scaffolds during in vitro tests.



Prof. Javier LLorca is scientific director and founder of the IMDEA Materials Institute, where he leads the research group on Bio/Chemo/Mechanics of Materials (https://materials.imdea.org/groups/bcmom/), and professor and head of the research group on Advanced Structural Materials and Nanomaterials at the Polytechnic University of Madrid. He is Fellow of the European Mechanics Society and of the Materials Research Society, member of the Academia Europaea and has held visiting positions at Brown University, Shanghai Jiao Tong University, Indian Institute of Science and China Central South University. He has received the Research Award from the Spanish Royal Academy of Sciences, the Distinguished Scientist Award of the Structural Materials Division of TMS, the Research Award from the Polytechnic University of Madrid and the Career Award from the Spanish Society of Materials (SOCIEMAT). His current research interests – within the framework of Integrated Computational Materials Engineering – are aimed at the design of advanced materials for engineering applications in transport, health care (implants) as well as energy (catalysis), so new materials can be designed, tested and optimized in silico before they are actually manufactured in the laboratory.