Consiglio Nazionale delle Ricerche

Istituto di Chimica e della Materia Condensata e di Tecnologie per l'Energia

ICMATE

Materials mechanical properties for sustainable energy production and transportation

Abstract - Reduction of greenhouse gas emissions for energy production is the first challenge of sustainability. However new energy production may require challenging solutions, where materials are going to carry out harsh and unknown conditions, and high temperature dynamic loadings and long-term creep can play a relevant role. High temperature investigation results on metallic alloys as high-alloyed steels and nickel-based superalloys foreseen/candidate in future energy productions like controlled thermo-nuclear fusion reactors and innovative critical CO_2 turbines coupled with focused solar power are reported. At the present, sustainability concern also other issues on actual supplying and production chains, so integrity assessment of industrial metallic products is an key issue for actual optimization of industrial production and also for long life-cycle prospective. So a scientific procedure based on the experimental and modelling analysis of tensile plastic behavior of a wide range of metallic alloys has been developed in ICMATE, in order to be standardized for industrial exploitation.

G. Angella is graduated on Physics at the University of Bologna; after being employed at Ansaldo Energia SpA, he had his PhD on Engineering Materials at the University of Sheffield, UK. At the present he is researcher in ICMATE-CNR in Milan, where he is head of the secondary branch.

Sustainable materials with tailored mechanical properties

Abstract: Designing materials with tailored mechanical properties and functionality is a great scientific and technological challenge, with huge potential for engineering applications and societal gains. A revolutionary approach of recent years has been to focus on materials that are structured on the meso/macroscale as in mechanical metamaterials, a novel class of artificial materials engineered to have exceptional properties and responses that are difficult to find in conventional materials. By optimizing meso-structure instead of chemical composition, it is possible to minimize the use of environmentally harmful materials and replace them with environmentally sustainable materials without loss of performance for the finished component. In this talk, I illustrate recent progress we made in collaboration with ICMATE on the automatic design of mechanical metamaterials.

Stefano Zapperi is currently professor of theoretical condensed matter physics at the University of Milano and associated scientist at ICMATE-CNR. He is the recipient of numerous awards including the Marie Curie Excellence Award, the Humboldt Research Award, an Advanced and Proof-of-Concept Grant from the European Research Council. He was elected fellow of the American Physical Society and named Finland Distinguished Professor by the Academy of Finland.

NET4Air

Seminar "Science for Sustainable Development"

Prof. Stefano Zapperi, Università Statale di Milano

Dr. Giuliano Angella, ICMATE Milano

27 September h 3.00 pm

Registration LINK