

**ADVANCED MANUFACTURING:
PRINCIPLES AND INDUSTRIAL SUSTAINABLE TRENDS**

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Abstract

Some trends and developments in the important engineering topic from industrial, research and academic point of view: *advanced manufacturing of advanced materials from macro- to nanoscale* subjected to static, low speed / high speed / hypervelocity impact and shock loading, with sustainable industrial applications to net-shape manufacturing, bioengineering, transport, energy and environment, defense and safety, an outcome of the very extensive, over 55 years, work on these scientific and industrial areas performed by the author and his research international team, are briefly outlined in the present Plenary Lecture of the *12th Japanese / Mediterranean Joint Workshop on Applied Electromagnetic Engineering for Magnetic, Superconducting, Multifunctional and Nanomaterials, JAPMED'12*, held in Batumi, Georgia on July 2023.

The topics considered may be listed as:

- Mechanics (Structural plasticity, Low / High speed impact loading, Hypervelocity impact, Shockwaves loading)
- Precision / Ultraprecision manufacturing from macro-, micro- to nanoscale (Metal forming, Metal removal processing, Surface engineering / Wear, Non-conventional techniques)
- Nanotechnology / Nanomaterials manufacturing
- Ferrous and non-ferrous materials (Metals, Ceramics, Superhard, Polymers, Composites, Multifunctional), from macro- to nanoscale (Nanostructured materials, Nanoparticles, Nanocomposites)
- Powder production and processing technologies (High strain-rate phenomena and treatment under shock: Explosives, Electromagnetics, High temperature / high pressure techniques)
- Biomechanics / Biomedical engineering
- Transport / Crashworthiness of Vehicles: Passive and active safety for passengers and cargo (Surface transport: Automotive, Railway; Aeronautics: Aircraft, Helicopters)
- Energy (Superconductors, Semiconductors, Electromagnetics, Solar cells, Photovoltaics, Nuclear reactors)
- Environmental aspects (Impact on climate change: Nanotechnology; Automotive industry; Aeronautics industry)
- Safety (Detection of explosives and hazardous materials)
- Defense (Ballistics, Projectiles hitting targets, Shock loading)
- Industrial sustainability