# MA TRANS

# Micro and Nanocrystalline Functionally Graded Materials for Transport Applications

**MAIN GOAL: to develop, characterise and model novel metal-ceramic functionally graded materials**

**FGM I: Alumina ceramics and copper or copper alloy**

**FGM II: Alumina ceramics and nickel-aluminum intermetallics**


**Project Coordinator**

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## PROJECT OVERVIEW

Aerospace and Automotive Applications:

I. Exhaust and propulsion systems (e.g. Thrusters);
required material properties: enhanced resistance
to high temperature, thermal shocks,
wear, oxidation and corrosion.

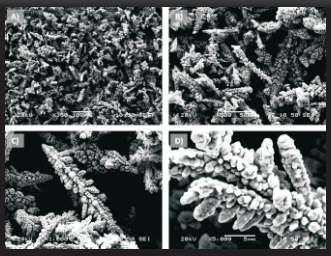
II. Power transmission systems (e.g. Valves);
required material properties: low specific weight,
resistance to high temperature, resistance to wear
and corrosion.

III. Braking systems (e.g. Brake disks);
required material properties: resistance to high temperature,
friction and wear, high bending strength in room temperature
and high temperature regimes, enhanced thermal conductivity,
structural stability in temperature cycles, lower specific weight.

## MATERIALS AND METHODS

Processing methods

- Powder metallurgy (MA, HP, HIP, SPS)
- High Velocity Oxygen Flame spraying
- Cold spraying
- Plasma arc spraying
- Foil casting, slip casting
- Pressure-assisted infiltration of ceramic preforms
- Pressureless infiltration



Characterisation of microstructure and properties

- SEM / TEM / AFM, micro-CT, synchrotron radiation CT
- Oxidation, corrosion, wear, fracture
- Thermal properties
- Residual stresses

Modelling of FGM design and properties

## PARTICIPANTS

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