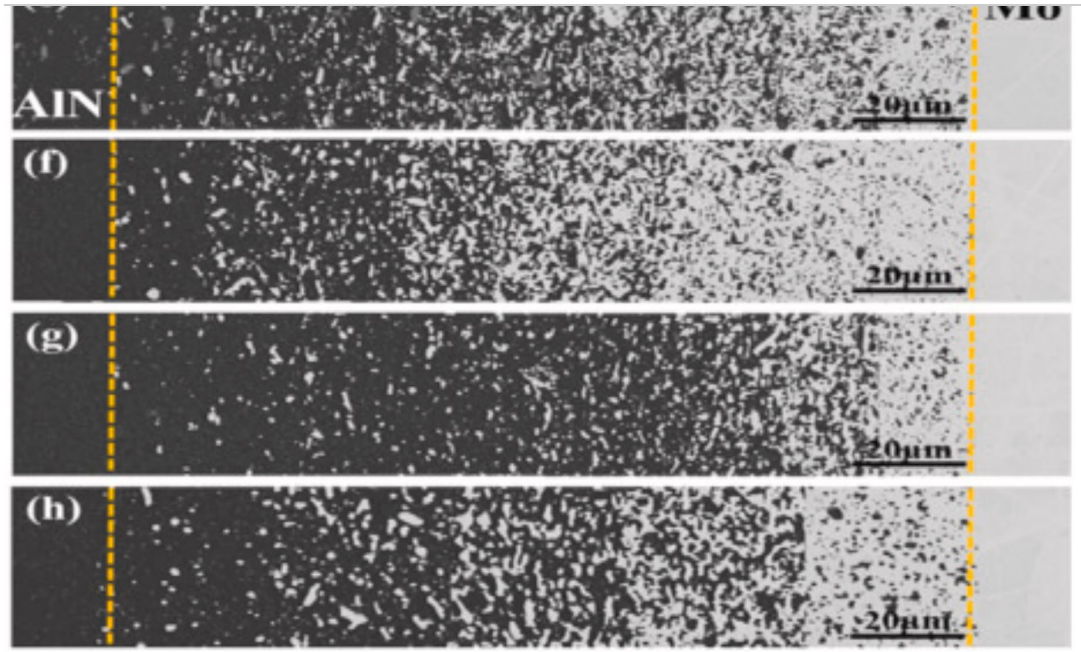
GRADED MULTIFUNCTIONAL METALLIC AND HYBRID MATERIALS



Material example, from [F. Chen *et al.* J Alloys Compd (2019) 152512]

Research group:
Prof. E. Gariboldi
Prof. M. Vedani

Description of the subject

- Innovative materials are more and more requested to react to external stimuli as ‘smart’ materials, in the sense that they provide a proper behaviour.
- The specific material response can be tailored to meet the target behaviour by means of a graded heterogeneous material with locally modulated composition/ structure/response.

Goals

- Identify a combination of functions and case studies, identify heterogeneous materials with locally tailorable properties of potential interest.
- Material development, characterization, definition of structure/properties relationship and applicability ranges. Case study part production and testing

ADVANCED COATINGS AND ALLOYS

Research group:
Prof. Nora Lecis
Prof. Maurizio Vedani

Description of the subject:

- Innovative research in mechanical engineering today is increasingly focused on the study of advanced engineered materials. These combine functional and bulk properties with the control of surface conditions, to determine interactions and degradations phenomena generated by external stimuli. Thus, the optimization of the surface conditions is a key factor to address the ever-increasing environmental requests from industry and global society.

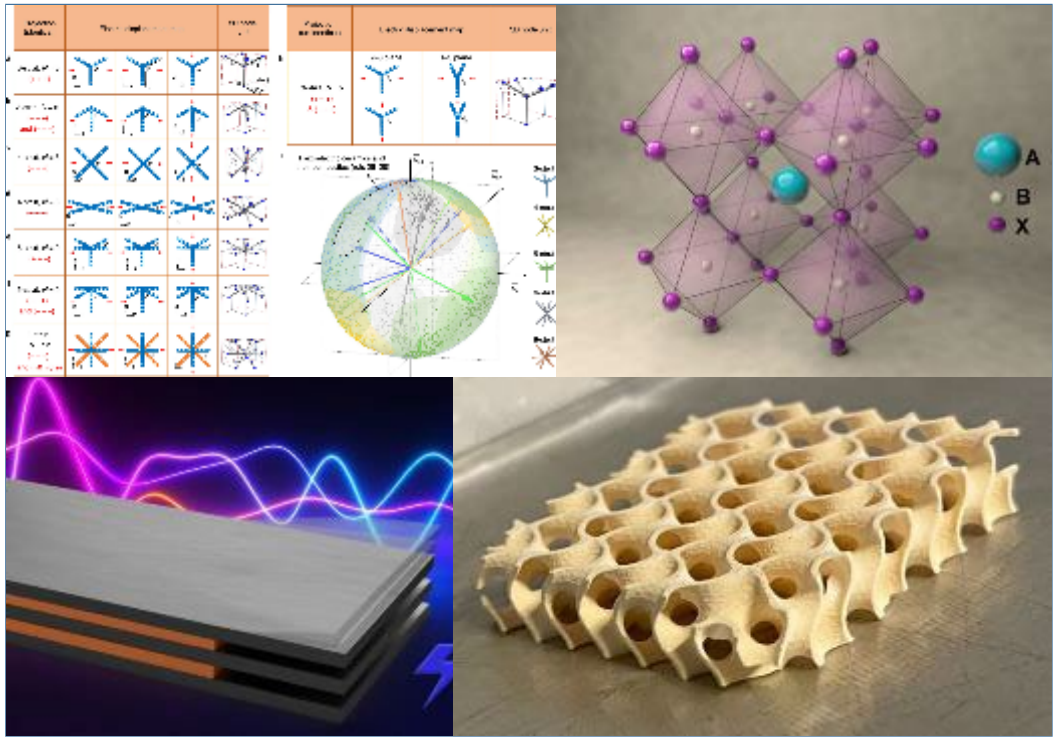
Goals

- This research aims at determining the optimal production techniques from powder or casting, with emphasis on the possibility of combining different materials (metal/metal, or metal/ceramic) to achieve superior mechanical properties.

Period abroad:

- Suggested

TAILORED PIEZOELECTRIC MATERIALS AND OPTIMALLY DESIGNED METAMATERIALS FOR ENHANCED MECHANICAL ENERGY HARVESTING



Research group:
Prof. Nora Lecis
Prof. Raffaele Ardito

Description of the subject:

- Introducing controlled porosity into the piezoelectric ceramic allows gaining relevant advantages for energy harvesting, compared to dense piezoelectric materials, due to the beneficial ratio between the piezoelectric coefficients and the permittivity. The piezoelectric features can be suitably designed through porosity, harnessing the capabilities of innovative techniques of additive manufacturing, leading to the precise engineering of materials with unprecedented electro-mechanical features.

Goals

- Optimal design of the metamaterial by adopting techniques of artificial intelligence, thus boosting the interaction with a piezoelectric resonator.

Period abroad:

- Suggested

FROM SCRAP TO ULTRACLEAN ALLOY

Research group:
Prof. Carlo Mapelli
Prof. Silvia Barella

Description of the subject:

- The increasingly stringent performance requirements, the use of new materials and the application of technologically advanced production processes cannot disregard the need to more performant material free of as much as possible defects. The shortage of raw materials and the need of environmental impact reduction led to the search of new solutions in the recycle of metallic material turn out in the increase in the product quality, reducing the production footprint.

Goals

- This research aims at implementing new processes and operational practice in a vision matching the requirements of the circular economy and energetic improvement.

Period abroad:

- Suggested