Project Area 10: Advanced Materials and Nanotechnology

Objectives: AP10 includes interdisciplinary skills for the synthesis, characterization, modelling and development of innovative materials and nanotechnologies industrial for processes. environmental, energy and bio-medical applications. The aim is to achieve a strong social and economic impact for the materials and nanotechnologies developed in AP10 in relation to the industrial leadership and societal challenges.

Approach: High-level skills aimed at the nanoscale level production of advanced materials have been developed in AP10. The main objectives are addressed to the development of i) ADVANCED MATERIALS FOR INDUSTRIAL PROCESSES: and materials for electronics magnetism, optoelectronic devices, plasmonic systems, photonics, nanofluidics for (bio-) sensors ii) ENHANCED MATERIALS AND NANOTECHNOLOGIES FOR ENERGY AND ENVIRONMENT: materials for electrochemical catalytic processes, storage, nanofluids, electrolysis, storage, high efficiency fuel cells, adsorption heat pumps, photocatalysis and photovoltaics iii) ADVANCED MATERIALS AND NANOTECHNOLOGIES FOR **BIO-MEDICAL** USE: multifunctional contrast agents, tissue engineering of scaffolds for tissue regeneration, biomimetic hybrids.

The activities are supported by numerical modelling and simulation studies for the prediction and processing of data and processes.

Industrial processes Energy & Environment Bio-medical sector SIMULATIONS SOFT MATTER ICROFILUIDIC **MOF/graphene** for CO₂ capture COPMAT ene **Fuel cell** ntracel catalyst Magnetic materials & 200 nm multiferroics Electrocta Hydrogen gen Materials based or Graphene for on-critical element CO sensors 200 nm Cell adhesion over functionalised scaffolds for bone regeneration Multiresponsive systems uth Vanad Energy efficiency New functionalities Emission reduction

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Energy and Trasportation Department

Scientific Impact/Results: The AP involves multi- and interdisciplinary aspects based on the use of highly complementary and converging skills. This is confirmed by the quality and the number of research projects, both at European and National levels. The AP impact regards the development of materials, processes, and technologies to: i) replace Critical Raw Materials ii) limit energy consumption iii) reduce emission of greenhouse gases iv) enable innovative solutions in sensitive contexts as healthcare iv) promote circular economy.