Metallic Materials Technologies Research Group at TUBITAK MAM has expertise in high temperature metallic materials (SX, DS & EQX Ni-based superalloys) for aviation & energy industry. The research group has fundamental knowledge in alloy designation and casting as well as significant amount of experience on post process heat treatments (HIP + VHT) and thermomechanical processing of these materials. In addition, the group provides well-equipped infrastructure dedicated to high temperature mechanical and microstructural characterization. The group has also research interests in lightweight materials including magnesium alloys and 3rd generation AHSS (TRIP/TWIP Medium Mn Steels (MMnS), Q&PT-TRIP Steels etc.) for automotive industry. Apart from high temperature and lightweighting applications, the team has experience in biomaterial applications of metallic materials such as magnesium and titanium alloys.

The facilities in our center include an investment casting laboratory with a foundry (VIM-VAR-ESR), a high temperature mechanical testing laboratory (fatigue, creep, tensile, nano-indentation, stress corrosion, crack propagation), post processing equipment (hot isostatic pressing (HIP), vacuum heat furnace), thermomechanical processing, a non-destructive testing laboratory, a metallography and microstructural characterization laboratory. Furthermore, researchers in this facility use simulation programs such as, NX3, Procast, ThermoCalc (DICTRA/TCPrism) and JMAT Pro.

CLUSTER 5

- **HORIZON-CL5-2024-D2-02-03: Size & weight reduction of cell and packaging of batteries system, integrating lightweight and functional materials, innovative thermal management and safe by design approach (Batt4EU Partnership)**

Scope: "The use of lightweight and multi-functional materials (including, but not limited to, the use of nanomaterials) and lightweight structures for battery casing.

"Improvements in both components in the cell and in the pack will be considered"

"Proposals are expected to also address innovations in the manufacturing processes that result in size and weight reduction of the packs"

- **HORIZON-CL5-2023-D5-01-03: Frugal zero-emission vehicles concepts for the urban passenger challenge (2ZERO Partnership)**

Expected Outcome: "Lower energy consumption by means of vehicle tailored to the urban environment conditions and constraints (e.g. lighter mass, suitable range and dynamic performances, higher utilisation of local resources, including reuse of components and systems, and eco-sustainable materials)".

- **HORIZON-CL5-2023-D5-01-09: Competitiveness and digital transformation in aviation – advancing further capabilities, digital approach to design**

Scope: "Aircraft development requires testing for airframe, dynamic systems, materials performance, new manufacturing techniques, propulsion, cabin and system and their sub-components in order to ensure their performance but also the highest level of safety. As a result, the proposal is also expected to develop methodologies and approaches dedicated to the use of combined experimental testing with numerical simulation in order to enhance the testing results and their integration - and therefore accelerate the development cycle".

Advance further design for manufacturing optimisations, including additive manufacturing, circularity and sustainability aspects.

- **HORIZON-CL5-2023-D5-01-06: EU Member States/Associated countries research policy cooperation network to accelerate zero-emission road mobility (2ZERO Partnership)**

- **HORIZON-CL5-2024-D5-01-03: Advanced battery system integration for next generation vehicles (2ZERO Partnership)**

"Structural battery pack design and integration in the vehicle considering trade-offs in all important areas such as energy density, thermal management, crash safety, energy density, production cost, second life, dismantling and recycling processes"

CLUSTER 4

- **HORIZON-CL4-2024-TWIN-TRANSITION-01-46: CO2-neutral steel production with hydrogen, secondary carbon carriers and electricity OR innovative steel applications for low CO2 emissions (Clean Steel Partnership) (RIA)**

  Scope: Contribute to innovative steel applications for low CO2 emissions.

- New or modified alloying concepts, downstream processing and manufacturing processes for new clean steel grades, as well as derivation of new test methods that are closer to reality into the industrial application;
- Clean steel grades with improved in-use properties obtained by controlling the application properties (e.g., yield strength and/or high ductility steels, fatigue, embrittlement, internal and external corrosion and other properties relevant to service life in the application) supported by known or new techniques (e.g., machine learning (ML), metallurgical / thermodynamic simulations, multi-scale models, defect vs. structure vs. properties correlations, finite element methods (FEM), realistic and applied testing methods) to realise the desired steel grade characteristics
- Advanced steel grades for different applications