

Synthesis of Project

Metal foams have been identified as a new class of material for lightweight design. Potential applications have been identified in transport industry, such as automotive, railway and aeronautics. They stem from the unique properties arising from the closed cellular structure and the metallic behaviour. The main properties such as high energy absorption capacity, high stiffness to weight ratios, low density, good sound absorption, etc, will increase the application field of these materials. For example, these materials can be used in crash protectors, in front and side panels of cars, bumpers, bonnets, and so on. However, it is necessary to improve the manufacturing process of these materials for commercial acceptance and production.

The FCEM project will be carried out on the foaming technology of metal foams (e.g. aluminium or its alloys) based on the powder metallurgical method that was developed and patented by Fraunhofer Institute for Applied Materials Research (in Bremen) and it is known as Fraunhofer-process. The Fraunhofer-process consists of mixing metal and foaming agent powders and subsequently compacting them to a dense semi-finished product (called foamable precursor material). The powders are usually compacted by hot pressing or extrusion. In a final step the foamable precursor material is foamed by heating it up to above its melting point. This softens the metal and simultaneously makes the foaming agent decompose and release gas, thus forming bubbles in the semi-molten metal and creating a highly porous structure.

This technology belongs to a recent research field and the development technology is growing up. It is important to solve the problems of uniformity of foam structure and reproducibility of foam production. According this, the objective of FCEM I&D project will be divided into the following main tasks:

- Conception and development of continuous furnace to allow the production metal foams components for automotive applications with good properties and performance.
- Adjust the production parameters in continuous process to obtain the final properties required by end-users.
- Development of on-line monitoring and control of process parameters (temperature, expansion, time) using finite elements software.
- Identify the final physical properties of metal foams when the input parameters of process are known.

The FCEM project will have a industrial company – M. J. AMARAL, that have experience in furnace production and that produces metallic components. It has supported by TERMOLAB (Águeda-P). The scientific support will be done by INETI with the protocol established with IFAM (Fraunhofer Institute-D), HMI (Hahn-Meitner-Institute-D) and INEGI-P that have the know-how required for thermal and structural analysis.