



Project MeTexCom2 - 2016/2017

Development of metal-textile composites with improved adhesion behaviour by structuring of metal surfaces with anodic TIG arc process or CW laser process

Objective

The goal of project MeTexCom2 is to develop high performance metal-textile composite structures using a joining technique that can be performed without additional adhesives. In this way the gluing step during the production of such composites can be skipped and the problematic emission of organic solvents can be avoided. The metal-textile composites are expected to show an improved adhesion, acoustic and armouring behaviour as well as good thermal insulating properties. Target applications are seen in the automotive and construction sector.

Methods

To reach the required properties of the final products the following methods will be used:

TIG arc and CW laser texturing of metal surfaces,
Preparation of acoustic and thermal insulating non woven,
Preparation of textile composites based on armouring textiles with polymeric interface,
Joining by heat pressing and lamination methods.

Background

Light weight structures often show a bad acoustic behaviour caused by their thin construction and lack of mass for damping. To improve the sound absorption in order to enhance the acoustic properties the combination of different materials, e.g. metal sheets and textile components, seems to be a promising approach. However, there is one main problem: the inherent bad adhesion between metal and polymer, which requires a strong gluing material. To overcome this disadvantage the TIG plasma treatment and the CW laser texturing provide new innovative techniques to improve the adhesion behaviour. With their help cavern-like micro or nanostructures can be generated on the metal surface. During the joining process the molten thermoplastic fibres of the fabrics used can infiltrated in the microstructures and permit a high-performance layered composite by improved adhesion and form fit.

Innovation

The innovation is based on two key technologies. One lies in the texturing of the metal surfaces using a TIG arc or CW laser technique to obtain cavern-like structures in nano and micron scale. The other one is the development of textile structures with integrated thermoplastic fibers or foils that can infiltrate in these surface structures during the joining where pressure and heat are applied. Another novelty of MeTexCom2 is the usage of inorganic reinforcing fibers in the woven textiles for armoring and reinforcing properties. Furthermore, an improvement of the adhesion behavior and an optimization of the texturing method, textile structures, and the joining methodology are aimed to achieve industry orientated results.

Expected Results

The result of the project is seen in:

Production of metal-textile composites with desired properties without the additional use of adhesives → very close linked to emission reduction of organic solvents like formaldehyde
Production of metal-textile composites with the required adhesion strengths and resistant to mechanical stress and stable in following processing methods
Reaching the desired properties in terms of acoustic, heat insulating (nonwovens) and reinforcing (wovens) behavior, especially after joining process
Technology and process optimization of TIG arc and CW laser texturing for relevant application areas.