

Procedure for Tailoring Multi-Material Structures by Local Adaption of Properties through Nano-Modified Materials



Short Description

- The invention shows a procedure for local nano-particle modification of a polymer in the area of material transitions in metal-composite-structures
- Metal-composite structures show remarkable differences in material properties especially in the transition region, e.g. strain and failure behavior → crack propagation and increased failure possibility
- Current solution for material modification show disadvantages:
 - Global Matrix-Nano-Modification: unintended changing of macroscopic material properties
 - Nano-modified adhesive connections: increasing of internal stress caused by different expansion coefficients

Solution

The procedure enables the operator to establish a local adaption of material property and behavior especially in the area of material transition in multi-material-structures including metals and composites.

For this, a pre-processed nano-modified composite which is the same as the composite from the structure, is used for building an interlayer which can be applied locally. Under influence of pressure and/or temperature, a laminate is build between metal and main composite layer, whereby nano particles will diffuse from the interlayer to the main composite layer. So, a gradual adjustment of nano-particle concentration can be achieved. Besides temperature and pressure, the concentration can be controlled via application time of assembly.

Benefits

- ✓ Local and accurate adaption of material properties
- ✓ Increased durability and stress parameters for constructions because of decreasing crack propagation
- ✓ More homogeneous properties among the whole structure

Applications

Multi-material structures, even complex geometries, for application in Automotive and Aeronautics

SPVA Sächsische Patent
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