

Coating of carbon fibre textile preforms to improve the infiltration properties and stability in aluminium alloys

Aluminum matrix composites are well known for applications in light-weight materials. But molten aluminum alloys are highly reactive and therefore reactions between fibre and matrix materials in the interface and formation of metal carbides as Al_4C_3 are a major problem. These reactions result in a degradation of the mechanical properties and corrosion resistance of the composite materials.

The main aim of Fraunhofer IKTS is the development of protective coatings or coating systems for the carbon fibre based 3D textile preforms by chemical vapor deposition (CVD) to prevent reactions between fibre and molten metal at high temperatures. Furthermore the developed layers should improve the wettability and infiltration properties of the coated preforms. Layer development will be carried out with different material systems including TiN, Al_2O_3 and SiC. Coatings which vary in crystallinity, phase composition and stoichiometry will be deposited as well as gradient layers or multilayer systems. Characterization comprises the examination of the layer properties like coating thickness, coating thickness distribution, adhesion, oxidation resistance and mechanical properties. Further investigations are related to the interface between fibre and coating and later to the interface of coated fibre and the metal matrix. Wettability and chemical resistance of the coated textiles and mechanical properties of the composite will be evaluated. Infiltration will be done by the project partners ILK and ZMP. Finally a continuously working CVD equipment will be designed for the best coating system.

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