

## Smart sandwich structures of plywood and GF/PP

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Taking into account that mechanical properties of a wood layer (veneer) integrated in the plywood structure are closer to thermoplastic glass fibre and polypropylene(PP) laminate than a clear wood specimen, it makes reasonable to combine these two materials for overall benefit in lightweight structure design. Typical modulus of elasticity for composite on the glass fibre basis is about 18-24 GPa. The same property for veneer subjected to hot pressing and adhesive impregnation is only little lower 14-17 GPa.



Fig.1. Example of plywood and GF/PP sandwich structure

In such a way disadvantages of one material component could be compensated by advantages of the other material. Thin glass fibre reinforced plastic (GFRP) layers could be applied for parts requiring complicated geometrical shapes and large bending angles; in opposite plywood sheets could successfully substitute GFRP for straight surfaces requiring increased thickness to prevent local damage.

Current research is part of the FP7 project MAPICC 3D under research theme: 'Nanosciences, nanotechnologies, materials and new production technologies'. The main goal is development of the methodology for one-shot manufacturing of the thermoplastic composites. Taking into account that polypropylene could be applied not only as a matrix for laminate but also as adhesive to bind plywood, variety of advanced sandwich structures could be designed with these two materials.

Main approaches employed to reach goal of the ultra-lightweight sandwich panels are numerical modelling of the mechanical behaviour of such panels, optimisation of the structure, prototyping and experimental validation of these prototypes.