

Tow Spreading Technology and Mechanical Properties of Thin Ply Laminates

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In aerospace and automotive fields, research and development of structural materials using carbon fiber reinforced plastics (CFRP) have been promoted. Recently, thin-ply preregs with a thickness less than 0.1mm, which have an extremely low fiber areal weight produced by using a fiber tow spreading technology, have attracted a significant attention. There are lots of studies indicating that the first ply failure such as transverse cracks and delamination are suppressed and various mechanical properties of CFRP are improved by use of thin-ply preregs, that are known as thin-ply effect. In fact, results of our previous studies showed the strain where the first ply failure occurred was extended just before the final failure under the static loading. Furthermore, we also confirmed that mechanical properties after the impact loading such as compressive after impact strength and fatigue properties were improved by thinning the ply thickness. These results revealed that freedom of structural materials can be expanded by use of this thin ply technology since more plies with various fiber orientations can be used when there is a limitation of thickness of the laminates. Therefore, using thin ply materials, the safer structural materials with a lighter weight can be achieved by expanding the design criteria of CFRP.