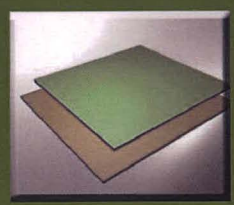
ADVANCES IN COMPOSITE MATERIALS



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Chapter 022

Variation of Fiber Architecture on Loads applied in Fabrication of Epoxy/Woven Fiber Glass Composites

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Keywords: Woven fiber glass composite, Compaction force, Volume fraction, Architecture.

Abstract: Fiber glass composite has emerged to be an alternative material for replacing structures made by metallic element which was formerly known to be the dominance in the commercial structure industries. In this work, woven plain weave fiber glass composite has been fabricated using the conventional hand-lay up method. The fiber volume fraction was found to linearly increase with increased of processing load from 98N to 981N. The highest compaction force at 981N produces sample with 70vol% of fiber. The increase of compaction force squeezes more matrix from being impregnated in the composite thus decreases the sample thickness. Voids and pores are also less in the sample processed at higher load. The application of high pressure retained small voids in the composite because of the composite packing density had reaches to the maximum prohibiting the movement of voids along with matrix flow. The low compaction force at 196N produces crimping angle at 20° and increasing this load to the maximum force at 981N deformed the yarn which caused the reduction of crimping angle to 10°. Because of the high compaction force the weft and warp fiber strand width dimension were also observe to be reduced.

Introduction

The consolidation of fiber composites is achieved through a combination of compaction, matrix impregnation and curing which appears to vary the architecture of fiber composite. The dependency of composite properties is related to the yarn geometry and fiber orientation which have important microstructural features; the properties of the fiber composite changes as the microstructural feature changes. This expression portrays the intrinsic features of the fibers, such as their diameter and length, as well as the volume fraction of fibers and their alignment and packing arrangement.

Previous study by Saunders et al. [1] show increasing compression load resulted in an increased of fiber volume fraction. The micro structural study had resulted deformed fiber yarns with an increased applied force thus decreasing composite thickness. Bannister et al. [2] observed that the weaved fiber architecture suffers high amount of distortion and crimping at 6.9 kPa compared to 4.14 kPa. They also found that a greater amount of