



ASTM D 3171

Standard Test Methods for Constituent Content of Composite Materials

These test methods determine the constituent content of composite materials by one of two approaches. Method I physically removes the matrix by digestion or ignition by one of seven procedures, leaving the reinforcement essentially unaffected and thus allowing calculation of reinforcement or matrix content (by weight or volume) as well as percent void volume. Method II, applicable only to laminate materials of known fiber areal weight, calculates reinforcement or matrix content (by weight or volume), and the cured ply thickness, based on the measured thickness of the laminate. Method II is not applicable to the measurement of void volume. These test methods are primarily intended for two-part composite material systems. However, special provisions can be made to extend these test methods to filled material systems with more than two constituents, though not all test results can be determined in every case. The procedures contained within have been designed to be particularly effective for certain classes of polymer or metal matrices.

Method I assumes that the reinforcement is essentially unaffected by the digestion or ignition medium. A procedure for correction of the results for minor changes in the reinforcement is included. Procedures A through F are based on chemical removal of the matrix while Procedure G removes the matrix by igniting the matrix in a furnace. Method II assumes that the fiber areal weight of the reinforcement material form is known or controlled to an acceptable tolerance. The presence of voids is not measured. Eq 9 and 10 assume zero void content to perform the calculation.

Significance and Use

A constituent content of a composite material must be known in order to analytically model the material properties (mechanical, physical, thermal, or electrical) of the composite which are affected by the reinforcement or matrix. Also, knowledge of the constituent content is required for evaluation of the quality of a fabricated material and the processes used during fabrication. The void volume of a composite material may significantly affect some of its mechanical properties. Higher void volumes usually mean lower fatigue resistance, greater susceptibility to moisture penetration and weathering, and increased variation or scatter in strength properties. Knowledge of



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the void volume of a composite material is desirable as an indication of the quality of a composite. Reinforcement content may be used to normalize mechanical properties affected by amount of reinforcement in the coupon.

If you have any questions concerning this particular ASTM method, please feel free to give our office a call at (800) 334-5432 or email us your inquiry at info@nhml.com.

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