Electrical and mechanical properties of phenolic resin and gigantochloa apus carbon fiber composites

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Abstrak

This work revealed electrical and mechanical properties of phenolic resin composites made from Gigantochloa apus carbon fiber, or bamboo carbon fiber reinforced polymer (BCFRP) composites. Bamboo fibers were carbonized at a temperature of 800°C, with a temperature rate of 4.2°C/minutes, held for 120 minutes. Carbon fibers were arranged in one direction. Phenolic resin weights were determined to be 5% to 10%. Higher carbon fiber contents indicated higher electrical conductivity of the composite. Increased carbon fiber content tends to increase the tensile strength of the composite, although this result was unstable. Mechanical instability was caused by cracks and cavities formed between the fiber and the phenolic resin. Cracks primarily occurred at the interface between bamboo carbon fibers and phenolic resin. This was most likely caused by the intrusion of air at the time the phenolic resin was cast. This air became trapped in between the fiber surfaces. Bamboo carbon fiber is fragile and easily broken in both longitudinal and transverse directions. When an air bubble bursts between carbon fibers, the carbon fiber braid breaks up, causing electrical resistance in composites. Not all carbon fibers in phenolic resin disconnect this way; most still form the strands that can conduct electricity. These breaks are the cause of the instability of the electrical conductivity properties of the composite.