

Intelligent CFGFRP Composites with Self-Diagnostic Function for Preventing Fatal Fracture

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CFGFRP (carbon fiber-glass fiber reinforced plastic) composites are materials with self-diagnostic function for preventing fatal fracture and detecting damage. When the carbon fiber bundles fractured, changes in the electrical resistance of the CFGFRP composites increased greatly, and afterwards, the CFGFRP composites were able to resist the load due to the presence of the glass fiber bundles. A large change in the electrical resistance can be conveniently used to prevent a fatal fracture by monitoring changes in the electrical resistance of the CFGFRP composites during loading. The point where a great change in the electrical resistance occurred could be controlled through suitable selection of the type of carbon fiber bundles based on its value of ultimate elongation. Changes in the residual electrical resistance were observed after unloading, and these changes were dependent on the maximum strain applied in the past for the CFGFRP composites. The method of monitoring changes in the electrical resistance of the CFGFRP composites during and after loading is simple in terms of technique and manageable in terms of cost for diagnosing latent damage and preventing fatal fracture. In the application of this method, changes in the electrical resistance of the CFGFRP-reinforced concretes were measured and were found to be similar to those of the CFGFRP composites. The CFGFRP composites used as concrete reinforcement are promising materials which have self-diagnostic function for preventing fatal fracture of the concrete.