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Doublet analysis of changes in electric potential induced by delamination cracks in carbon-fiber-reinforced polymer laminates

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Doublet analysis of changes in electric potential induced by delamination cracks in carbon-fiber-reinforced polymer laminates

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**Abstract:**

The early detection of delamination cracks, which compromise the compressive strength of carbon-fiber-reinforced polymer (CFRP) laminates, is necessary to guarantee the integrity of CFRP structures. In this study, a simple analysis method for calculating the changes in the electric potential induced by delamination cracks in CFRP laminates is proposed for three-dimensional structures. First, a three-dimensional orthotropic doublet potential function is newly defined to simulate the delamination cracks. This function is then combined with a simple electric current analysis technique, specifically, the orthotropic electric potential function method. This novel method can be applied in a practical nondestructive detection technique to determine the location and size of delamination cracks. Comparison with results obtained using the commonly used finite-element method demonstrates the effectiveness of the proposed simple analysis method for calculating changes in electric potential.

**Key words:**

Electric potential, Delamination crack, Doublet, Electric current

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