

## **Modeling of interaction between delamination and matrix cracks of CFRP composite laminate by XFEM using the Cohesive Zone Model**

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### **ABSTRACT**

The extended finite element method (XFEM) using the cohesive zone model (CZM) is applied to damage propagation analyses of Carbon Fiber Reinforced Plastics (CFRP) composite structures. Interaction between delamination and matrix crack should be considered in order to model damage of CFRP composite laminate. Delamination may propagate between two layers and it can be modeled easily by interface elements. On the other hand, position where matrix crack occurs cannot be known in advance. Therefore, in the proposed method, delamination is modeled by interface elements utilized in the conventional FEM, and matrix crack is modeled independently of finite elements through the framework of XFEM. The cohesive zone model (CZM) is introduced to both delamination and matrix crack. In-house XFEM codes based on the proposed method were developed and applied to DCB/ENF/FRMM test specimens of CFRP composite material and the results including static/implicit dynamic/explicit dynamic analyses were verified through comparison with those by the conventional FEM. It was shown that the proposed method provides the appropriate results.