

Damage propagation analyses of CFRP composite laminate by XFEM using CZM

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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 laminate. 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. CZM is introduced to both delamination and matrix crack. In-house XFEM codes based on the proposed method were developed and applied to test specimens of CFRP composite material and the results were examined. It was shown that the proposed method provides the appropriate results.

Keywords: XFEM, CZM, CFRP, delamination, matrix crack, damage propagation