Analyses of Energy Release Rate for Interface Fracture of Elastic Multilayered under Four-Point Bending

Chang-Wei Huang

Department of Civil Engineering, Chung Yuan Christian University, Taoyuan, 32023, Taiwan

*Corresponding Author: Chang-Wei Huang. Email: cwhuanghtc@gmail.com.

Abstract: This paper focuses on the interface energy release rate of elastic multilayered beam subjected to four-point bending. Linear elastic fracture mechanics (LEFM) and extended finite element method (XFEM) are adopted to investigate the interface fracture of composite beams. Numerical results obtained from simulations not only verify the accuracy of closed-form solutions for the steady-state interface energy release rate, but also provide the evolution history of interface energy release rate under different crack length. In addition, non-dimensional parametric analyses for interface fracture energy release rate are carried out for the discussion of effects of crack length ratio, elastic modulus ratio, and thickness ratio on energy release rate. The results demonstrate that elastic modulus ratio and thickness ratio have distinct influence on the interface fracture energy release rate for multilayered beams. Furthermore, numerical simulation results also demonstrate that the unstable interface fracture intends to occur for elastic multilayer beams with higher flexural stiffness on the upper sub-beam. The unstable interface fracture shows the decreasing of the interface fracture energy release rate with increasing the interface crack length.

DOI: 10.32604/icces.2019.05418 www.techscience.com/icces