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Outline of Dissertation

Characterization of fiber-matrix interfacial debonding based on a continuum damage model

(Bentang Arief Budiman)

This dissertation aims to characterize a fiber-matrix interface by considering the debonding process. It consists of five chapters which are briefly described as follows,

In chapter 1, *introduction*, applications of fiber-matrix composite are summarized. A comprehensive discussion about interfacial region between fiber and matrix is given. It emphasizes on the remaining problems that should be solved in interfacial debonding characterization. Recent relevant studies on the interface are also highlighted.

In chapter 2, *new parameters for interfacial characterization*, the conventional analysis of single fiber fragmentation test (SFFT) for interfacial evaluation is briefly explained. FEA model for SFFT is then developed. In order to get a right model, parametric studies are conducted for geometrical parameters and mechanical properties of fiber and matrix. Furthermore, simulations with different values of interfacial properties are also conducted to find characteristic lengths in matrix stress contours indicating the interfacial properties.

In chapter 3, *relationship between characteristic lengths and interfacial properties*, the relationship between matrix stress contours and the interfacial properties is revealed theoretically. Stress-based and energy-based approaches are conducted to characterize the interfacial properties. Moreover, non-dimensional analysis to find the relationship between characteristic lengths and interfacial properties is also demonstrated.

In chapter 4, *experimental realization for observing matrix stress contours*, an apparatus consists of a mini tensile test, high-resolution of microscope camera, and photoelastic tools are designed. Two specimens using as-received and conditioned fiber surfaces are characterized. The image of matrix stress contours captured by using this apparatus is also discussed. In addition, the method to analyze the captured image is explained.

In chapter 5, *conclusions and future works*, the conclusion of this dissertation is summarized with potential future works.