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Crack propagation simulation for lap joints considering adhesion

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This study presents a numerical evaluation method for adhesive-bonded single-lap joints. A previously proposed numerical method was capable of simulating crack propagation, and its applicability had been confirmed under shear deformation.

However, the conventional model had limitations in representing the complex mechanical behavior of the adhesive layer and cracks occurring in arbitrary directions. The present study extends this approach to evaluate the adhesive region under bending loads and compares the results from the CST and B-bar elements.f

Figure 1 shows the numerical simulation of single-lap joints, and bending deformation is employed. Figure 2 shows the comparison of the damage distribution between the CST element and the B-bar element with each number of layers. Figure 3 shows the force-stroke curve. The result using the B-bar element is better than that of the conventional CST element.

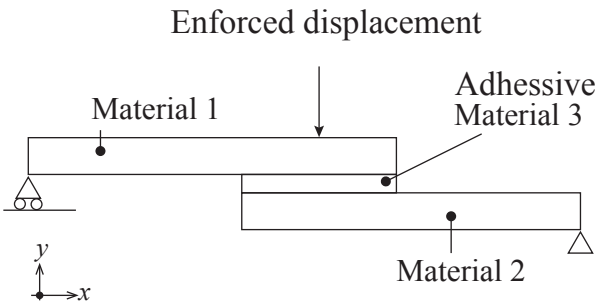

Figure 1 Illustration of bending test

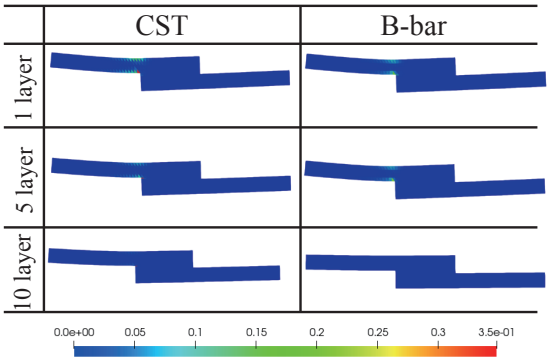

Figure 2 Damage Distribution Comparison for CST and B-bar results

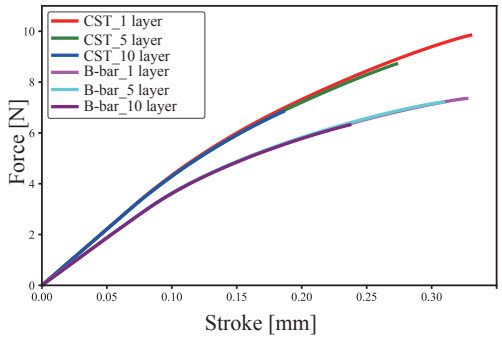

Figure 3 Force-Stroke curve Comparison for CST and B-bar results