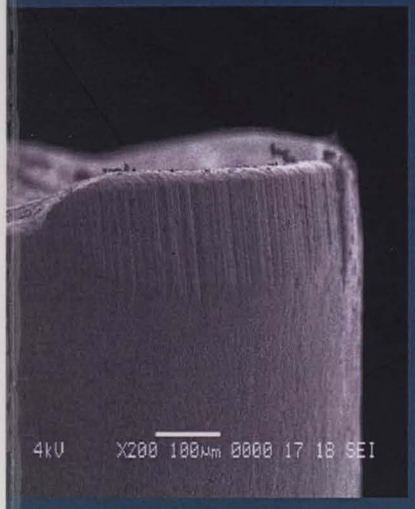

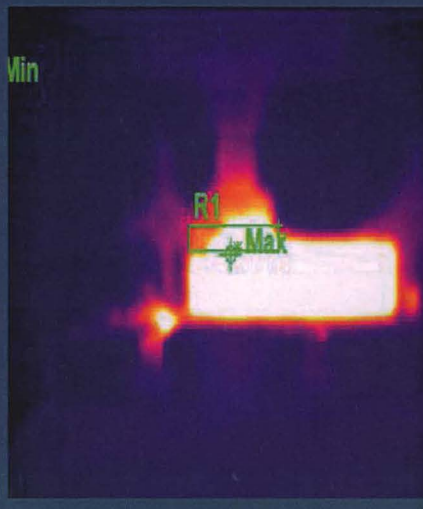

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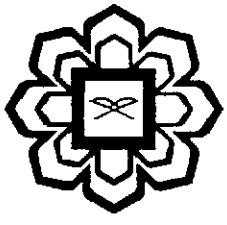

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PART III: MATERIALS

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Chapter 24

Numerical Analysis to Characterize Triaxiality Value of Adhesive Joint due to particular Load Configuration. Part 2: Cleavage and Scarf Joint

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1. Triaxiality characteristic of Cleavage Joint

A cleavage joint is a joint that can receive a mixed loading even tough it is only subjected to a tension load. Effect of surface roughness on the cleavage strength of standard steel/steel cleavage specimens have been presented[1]. The stress distribution of adhesively bonded metal/metal single lap joints under cleavage loading is analyzed using 3D elastic–plastic finite element method (FEM)[2].

The geometry of joint as shown in Figure 1 that makes one line of the tension load can be transferred into the tension and the bending. From its geometry profile, it is easily to predict that half layer of an adhesive bondline will suffer compression whilst the other half will suffer tension. Analysis is performed to a cleavage joint model, which is referring to the standard cleavage joint. A modification has been made by change the thickness to 5 mm. The purpose of this changing is to lower the tension load needed to make this joint fail.

1.1. Cleavage Joint modeling method

Solid model of a modified cleavage joints and zooming at adhesive region are shown in Figure 2 (a) and (b) respectively. Figure 2 (a) shows a solid model of a cleavage joints with four substrate and two adhesive volumes. The adhesive was modeled with two volumes so that the stresses results from the middle layer of adhesive can be extracted. Meshing is shown in Figure 3 (a). Boundary conditions were given with a tension load 1000 N distributed at the upper area of the hole in the upper substrate and fixed support at the lower area of the hole in the lower substrate as shown in Figure 3 (b).