The stress analysis of the adhesive's influences on bonded substrate

李柏泱、林海平

E-mail: 9806425@mail.dyu.edu.tw

ABSTRACT

In this investigation, the adherend of the adhesively bonded joint is modeled as a 1-D beam. Based on the mechanics of material, the analytical solutions of the shear and peel stresses in the adhesive are obtained first, and by considering the force-balance of the system, the strain of the adherend can be obtained. Then, the analytical solutions of adhesive ’ s stress and adherend ’ s strain are compared with the 2-D finite element solutions (numerical solution). The analysis of bonded joints involves three different types of applying loadings: axial force, moment, and both axial force and moment. The distribution of the adhesive ’ s stresses and the strain of adherend are discussed. The parameters which may effect the distribution of the adhesive ’ s stresses and the adherend ’ s strain, including mechanical properties, geometries of adhesive/adherend, and the length of bonded joints are studied. Finally, an experimental tensile test with axial force on bonded joints is set to validate the analytical solutions of the adherend ’ s strain distributions

Keywords : adhesively bonded joint, beam theory, shear stress, peel stress, strain,parameters study

Table of Contents

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