Title

NANO-SILICA PARTICLE TAILORED COMPOSITE ADHESIVE JOINTS

Abstract text

A theoretical framework is presented for the stress analysis of adhesively bonded double-lap composite joints subjected to tensile loads. The joints are composed of similar and/or dissimilar orthotropic/isotopic linear elastic adherends and and a nano-silica particle tailored adhesive interlayer. The modulus of the adhesive interlayer is graded along bond length by varying the volume fraction of nano-silica particles. Thickness variation of stresses in addition to longitudinal stress in the adhesive interlayer is considered in this generic formulation. Traction-free boundary conditions are strictly enforced to accurately capture steep stress gradients at the overlap ends of the adhesive layer. Two-dimensional plane-strain/stress elasticity theory in conjunction with the variational principle of complementary energy is employed to obtain the governing equations. Results from both plane-strain and plane-stress models indicate that efficient adhesive joints can be designed by optimally tailoring nano-silica particles in the adhesive layer over bond length.

Keywords

COMPOSITE JOINTS, ADHESIVE, INTERFACE MODELING, MATERIAL TAILORING, STRESS ANALYSIS, VARIATIONAL METHOD

Author

SHANMUGAM, KUMAR (MASDAR INSTITUTE)