World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

Modifications in Design of Lap Joint of Fiber Metal Laminates

Authors : Shaher Bano, Samia Fida, Asif Israr

Abstract : The continuous development and exploitation of materials and designs have diverted the attention of the world towards the use of robust composite materials known as fiber-metal laminates in many high-performance applications. The hybrid structure of fiber metal laminates makes them a material of choice for various applications such as aircraft skin panels, fuselage floorings, door panels and other load bearing applications. The synergistic effect of properties of metals and fibers reinforced laminates are responsible for their high damage tolerance as the metal element provides better fatigue and impact properties, while high stiffness and better corrosion properties are inherited from the fiber reinforced matrix systems. They are mostly used as a layered structure in different joint configurations such as lap and but joints. The FML layers are usually bonded with each other using either mechanical fasteners or adhesive bonds. This research work is also focused on modification of an adhesive bonded joint as a single lap joint of carbon fibers based CARALL FML has been modified to increase interlaminar shear strength and avoid delamination. For this purpose different joint modification techniques such as the introduction of spews and shoulder to modify the bond shape and use of nanofillers such as carbon nano-tubes as a reinforcement in the adhesive materials, have been utilized to improve shear strength of lap joint of the adhesively bonded FML layers. Both the simulation and experimental results showed that lap joint with spews and shoulders configuration have better properties due to stress distribution over a large area at the corner of the joint. The introduction of carbon nanotubes has also shown a positive effect on shear stress and joint strength as they act as reinforcement in the adhesive bond material.

Keywords : adhesive joint, Carbon Reinforced Aluminium Laminate (CARALL), fiber metal laminates, spews
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020