NASA TECH BRIEF

Marshall Space Flight Center

Fatigue of Boron-Aluminum Composites Bonds and Joints

Composites hold considerable promise as lightweight, high modulus, corrosion resistant, structural materials. There are, however, several technical problems to be overcome before composites can be widely used. A study of one such problem, the bonding and joining of composites, is discussed in detail in a recent study.

The effects of boron filament diameter on bonds and joints are examined for boron-aluminum composites. The data developed were not previously available and will be of interest to many industries considering the development of composite technology.

The data include static strength, fatigue, and dynamic moduli of elasticity; Manson-Coffin analyses and metallurgical and fracture surface evaluation were also performed. The joining methods examined are diffusion bonding, aluminum dip brazing, low-temperature brazing, resistance welding, riveting, and mechanical fastening.

The intent of the study has been to provide a preliminary view of fatigue of B/Al joints. In addition to the substantial quantity of data accumulated, several conclusions concerning B/Al composites were drawn.

a. The static and fatigue strength of B/Al, unidirectionally reinforced with 0.14 mm (5.6 mil) boron, is superior to that of B/Al reinforced with 0.10 mm (4.0 mil) boron.
b. The static and fatigue strength of some joints in B/Al reinforced with 0.10 mm (4.0 mil) B is superior to those joints reinforced with 0.14 mm (5.6 mil) B.
c. The fatigue strength of Hi-Lock fastener joints is superior to that of resistance weld or rivet joints.
d. The fatigue strength of low-temperature braze joints is inferior to that of dip braze or diffusion bond joints.

Note:

Requests for further information may be directed to:

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