

Machining of Boron/Epoxy Composites

Drilling

Boron-epoxy composites can be drilled using diamond coated core drills at 5000-rpm spindle speed utilizing steel back-up fixtures and either free flowing or submerged coolants. To provide increased tool life, the drill should be withdrawn from the hole several times, and the trepanned boron slug should be removed from the core of the drill after the hole is completed. ECM (Electro-chemical machining), EDM (Electro-discharge machining), and Laser Machining are not successful on boron-epoxy composites, although EDM is an effective method for drilling aluminum matrix-boron composites.

Profile Machining

Boron-epoxy composites must be fully supported during machining to prevent fiber delamination. Diamond impregnated burr tools are required and coolant is recommended although dry cutting is possible. Machining speed over the wide range of 1500-2500 rpm appears to be satisfactory along with slow-to-moderate work piece feed rates.

Cut-Off and Slitting

Boron-epoxy composites can be slit on a table saw or on a cutter-grinder machine. Diamond cutting wheels are needed and work piece must be supported to obtain clean cuts. Coolants have shown to be advantageous and saw speeds of 6000 to 9000 rpm with in-feed rate of 4-6 inches per minute have been employed.

Grinding

Grinding and abrasive cut-off are effective methods for machining boron composites. Diamond wheels appear best although silicon carbide and alumina wheels can be used. Coolants are required to prevent matrix thermal degradation, and speeds used have been in the range of 3000 to 8000 feet per minute.