

# Firebrake<sup>®</sup> ZB in epoxy



Firebrake<sup>®</sup> ZB is used as a flame retardant, smoke suppressant, and afterglow suppressant in both halogen-free and halogen-containing epoxy, including intumescent coating, adhesives, flooring, glass-reinforced laminates, potting, and encapsulation of electrical components.

Firebrake ZB has a typical median particle size of 9 microns. To enhance fire performance and achieve the best physical properties, Firebrake ZB is also offered in a fine grade (Firebrake ZB Fine) with a typical particle size of 2.3 microns.

### Halogen-containing epoxy

#### Flame retardant synergist

Firebrake ZB acts as a synergist of halogen sources and antimony oxide in the formulation. Based on the performance results presented in Figures 1 and 2, Firebrake ZB can replace 40% to 100% of antimony trioxide in epoxy formulations with same performance.

#### Smoke suppression

Firebrake ZB is shown to suppress smoke formation even in the presence of antimony oxide, which adversely affects smoke generation (Figure 3).

#### Char formation

Firebrake ZB is an effective char promoter, which helps with intumescent applications of epoxy resins (Figure 4).

### Halogen-free epoxy

#### Flame retardant synergist

Firebrake ZB displays synergy in fire test performance when used in conjunction with ammonium polyphosphate, alumina trihydrate, and silica.

#### Smoke suppression

Firebrake ZB is an effective smoke suppressant in many formulations.

#### Char/ceramic formation

Firebrake ZB promotes char formation and development of strong ceramic structure for intumescent applications.

Figure 1: Oxygen index and UL-94 test of EPON<sup>™</sup> 828

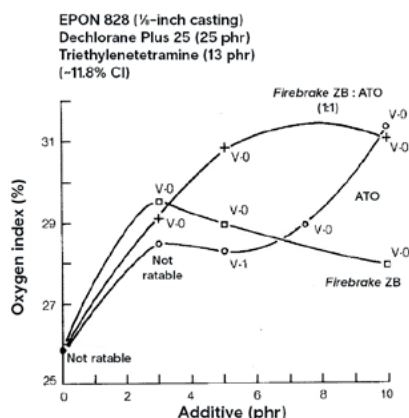


Figure 2: Oxygen index and UL-94 test of EPON<sup>™</sup> 828

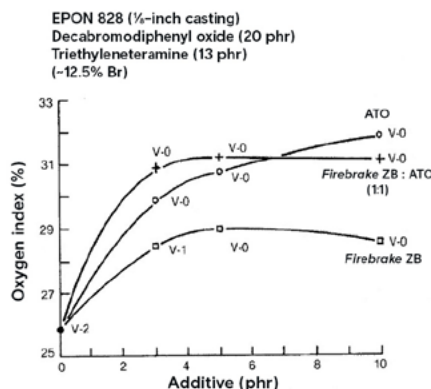


Figure 3: ASTM E-662 smoke test of epoxy containing dechlorane plus and Firebrake ZB

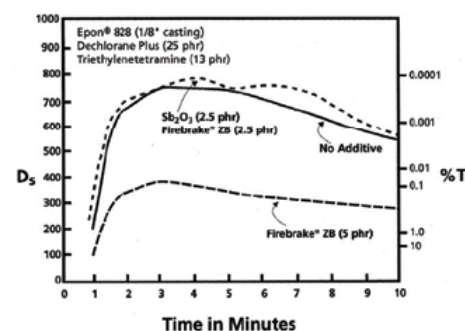


Figure 4: Intumescent char of epoxy. Top sample contains Firebrake ZB and dechlorane plus.



## BROCHURE: FIREBRAKE ZB IN EPOXY

### General guidelines

Recommendations for levels of treatment depend on the desired fire test performance, the need for halogen-containing or halogen-free formulations, and the presence of other co-additives.

In a halogen-containing epoxy, a good starting-point is the replacement of 30 to 50 wt% of antimony trioxide with *Firebrake ZB* in flame retardant formulations. If equal or improved fire performance is achieved, complete antimony oxide replacement can be targeted.

In halogen-free epoxy, depending on the specific end-use application and fire standard to be met, one can either use *Firebrake ZB* alone or *Firebrake ZB* in conjunction with ammonium polyphosphate, silica, phosphate ester, or aluminum trihydrate.

Specific formulation recommendations are available upon request.

### About U.S. Borax

U.S. Borax is a global leader in the supply and science of borates—naturally-occurring minerals containing boron and other elements. We are 1,000 people serving our customers with more than 1,200 delivery locations globally. We supply around 30% of the world's need for refined borates from our world-class mine in Boron, California, about 100 miles northeast of Los Angeles.

### About 20 Mule Team products

U.S. Borax produces the *20 Mule Team*® borates family of products from naturally occurring minerals and have an excellent reputation for purity and safety when used as directed. Borates are key ingredients in a number of industrial applications including fiberglass, glass, ceramics, batteries and capacitors, wood preservatives, and flame retardants.

High quality, high reliability, high performance borate products. It's what we're known for.



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