



## Best Practices in Glass Recycling

### ***Epoxy Applications for Recycled Glass***

#### **Material: Recycled Glass**

**Issue:** *Epoxy binders are used in countless applications to manufacture composite materials. Some of these applications can use recycled glass as the aggregate. The physical properties required for the application will determine whether glass is an appropriate aggregate.*

**Best Practice:** Epoxy” is a term referring to a family of resins, usually thermosetting, capable of forming tight cross-linked polymer structures marked by toughness, strong adhesion, and high corrosion and chemical resistance. Epoxies are generally two-part systems consisting of a resin and a hardener or activator that are combined in specific proportions to initiate a curing process. Epoxies are sometimes used by themselves in applications such as industrial tooling. However, epoxies are also used as binders to make composite materials. In most of these cases, epoxies are combined with inert aggregates to achieve specific properties.

When epoxies are combined with aggregates, the purpose of the aggregates may be to lower the cost of the composite by adding volume to the epoxy, change the surface texture, increase the wearability of the surface by adding a harder aggregate, or improve the aesthetics of the surface by adding colored aggregate to clear epoxy.

When epoxies are used to make molds, the epoxy may be the most expensive component in the mold mixture. Other inert materials may be added to decrease the expense of the mold. At the same time, the addition of appropriate lightweight inert aggregates may also lighten the weight of the mold. In some cases, denser materials may be added to increase the density of the mold.

Abrasive flooring is an example of surface texture modification by aggregates. Coefficient of friction floors are increasingly being used in industrial environments where oils or fats on the floor can cause slipping. Hard aggregates may either be combined with epoxy binders before applying to the existing base floor, or may be broadcast onto the surface after the epoxy has been applied, but before it has hardened.

Some abrasive tools are made by combining hard aggregates with epoxy binders. The aggregate is harder, sharper, and wears slower than the epoxy. The epoxy holds the aggregates together while the aggregates abrade the target surface. The binders and epoxies wear together, constantly exposing a new abrasive surface.

Many composition countertops are made with epoxies and aggregates. The epoxy is clear. The aggregate adds color and improves surface properties such as resistance to knife cuts.

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In all of the applications described above, the important characteristics of the aggregate are that it possess the correct physical properties for the application, and that the epoxy binders adhere adequately to the surface of the aggregate. Crushed, graded recycled glass has been tried in a number of epoxy/aggregate applications. Coefficient of friction floors using glass instead of the standard grit have been laid. Countertops using crushed glass rather than colored stone have been made. In countertops, it has been found that, while glass adds aesthetic appeal, machining the glass/epoxy countertop wore out tools faster than machining the stone aggregate/epoxy countertop.

Experience to date indicates that the epoxies tried have adhered properly to the glass surfaces. Since epoxy appears to adhere adequately to glass surfaces, the functionality of glass as an aggregate in these applications will depend largely on the specific physical properties desired and the cost of the glass. In most cases, it will be necessary for the glass to be processed to industrial minerals qualities in the appropriate gradation for the glass to be acceptable.

**Implementation:** A glass processor seeking a market for crushed, graded glass may want to contact businesses manufacturing epoxy composites. The physical characteristics of the glass, the capabilities of the processor, and cost will determine the market potential.

**Benefits:** Glass is an inert, hard, sterile material which, when properly processed, may find markets as an aggregate in epoxy composite materials.

**Application Sites:** Manufacturers of epoxy composites

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