

Guide to Fillers

This guide describes the relevant properties of different filler systems presently supplied by Duroplastics. They are used together with various resins, (polyester, vinyl ester and epoxy resins) to modify their properties. The fillers form three distinct categories:-

- 1 Hollow Spheres or Microspheres
- 2 High density fillers (Mineral Dusts)
- 3 Colloidal Silica

1 **HOLLOW SPHERES**

Hollow spheres can be generally described as "microspheres". They serve to increase the volume and reduce the density of any filled resin system to make adhesive and filling and fairing mixes. Since microspheres do not absorb resin into their internal cavities they are useful for creating both low density filler mixes and syntactic foam for cosmetic and structural applications.

1- a) **Capolite**

Capolite is made of hollow plastic resin spheres making them particularly useful for cosmetic fillet joint and fillers in wood boat building. Also ideal for filling polyester, polyurethane, epoxies and many other systems to extend bulk and reduce density. See article on application of Capolite

Composition : White Plastic Spheres
 Appearance : White Powder
 Particle size : 50 microns
 Density : 200, 400 and 800 g / litre

2-b) **Glass Bubbles**

Glass bubbles are hollow glass spheres with a more variable particle size than microballoons. Being composed chemically of glass, they are physically harder than microballoons and filled resin mixes are noticeably more difficult to sand. However, glass bubbles produce a more waterproof filler mix and are often used on below-waterline applications on boats. Being significantly less expensive than microballoons they are often preferred if ultimate sanding performance and colour are not of prime importance.

Composition : 'C' glass
 Appearance : White powder
 Particle size : 40-80 microns
 Density : 200g / litre

2-a **WOLLASTONITE**

Wollastonite are very fine MINERAL fibres commonly used to create structural adhesives for bonding both wood and g.r.p. Because any low viscosity resin systems is readily absorbed into the fibres, an unfilled adhesive may have a tendency to give a "dry-joint". Wollastonite should always be used on wood joints in preference to hollow sphere-types of filler as they make a structurally stronger joint.

Composition : Milled mineral long aspect ratio fibres
 Appearance : White shiny fibrous consistency(similar to mica)
 Particle size : 200 - 400 microns
 Density : 850g / litre

2-b **CALCIUM CARBONATE**

Calcium Carbonate (sometimes called KULU) comes in different grades depending on the micron size (from 2 to 30) . Also can come in different purities depending on consistency of deposit. This is a general filler used in many thermoset resins such as polyester, epoxies and polyurethanes. Can be filled to up to 200 parts to 100parts resin without too much of a drop in viscosity. It does however not

increase the volume by that much but probably by about 25% of the mass. ie if loading to 1:1 then volume increase will be about 125 compared to that of 100 of the resin.

Composition : Calcium and Magnesium Carbonate

Appearance : White , off white powder

Particle size : 2 to 30 microns

Density : 2.6kg/litre

3 COLLOIDAL SILICA

Colloidal silica is an agent which is used to control the thixotropy or "sag" characteristics of a given resin system. By adding colloidal silica in varying amounts to a resin mix containing the other filler types mentioned, the handling characteristics can be controlled. Relatively small quantities added to a resin mix containing a hollow sphere filler such as glass bubbles, microballoons of Litecell will give non-sag properties and impart easier handling. Colloidal silica is also added with microfibres to produce a mix suitable either as a high strength non-sagging structural adhesive, particularly for non-absorbent materials such as g.r.p., or as a "high density" filler. The inclusion of colloidal silica has the effect of increasing the hardness of the resulting mix which will create more difficulty when sanding. For this reason colloidal silica is usually added in relatively small quantities to any mix for which sanding is anticipated. In some applications this feature can be used to advantage to create a hard wearing edge or surface.

Composition : Silicon dioxide

Appearance : White powder

Particle size : 0.012 microns

Density : 50g / litre

Typical addition levels of filler to Duroplastic resin systems, are given in the following table. In each case, the filler is given in a ratio to resin in mass Resin is taken as 100 parts.

	Adhesive Mix (for bonding)	Filler Mix (for filling & fairing)	Casting (Thin resin)
Capolite	15 - 20	25 - 30	5 - 15
Glass Bubbles	15 - 20	25 - 30	3 - 8
Calcium Carbonate , Wollastonite	NA	NA	50 - 250
Colloidal Silica*	3	2 - 5	DO NOT USE

* Generally used in combination with other fillers