

Converting Mix Ratios

Converting Mix Ratio by Weight to Mix Ratio by Volume for Two Component Epoxies

WHAT

Mix ratio by weight to mix ratio by volume

WHY

Large errors can occur when mix ratios are not calculated properly

1. What Is Mix Ratio?

Mix ratio of a two part epoxy is extremely important in achieving a proper cure. Epoxies use a chemical reaction between a resin and hardener which have a stoichiometric ratio that determines the relative proportions in which the two substances react for this reaction. This ratio can vary from product to product and is reported on each Technical Data Sheet.

2. Why Is It Important?

Although different chemistries have different tolerances for mixing, an error of no more than +/- 5% from the mix ratio is a good guideline. Larger errors in the mix ratio can allow un-reacted components to remain within the epoxy and may lead to an increase in outgassing, a decrease in Tg and decreased resistance to chemicals and moisture.

3. Where Do I Find It?

Epoxy Technology lists the mix ratio for all two part epoxies by weight on the Technical Data Sheet. For some processes, however, a customer may find it more convenient to measure and mix by volume rather than weight. Using the reported mix ratio by weight to mix by volume can cause products not to cure properly.

4. How To Convert

The volumetric mix ratio can easily be determined from the weight mix ratio by using the specific gravities of each component also reported on each data sheet. Specific gravity is a unit-less quantity defined as the ratio of the density of a material to the density of water. Because water has a density of approximately 1 g/cc, the specific gravity can be considered the density in units of g/cc for the purpose of these calculations.



EXAMPLE ONE

EPO-TEK® 353ND

Consider EPO-TEK® 353ND where the mix ratio by weight is 10:1, and specific gravities are 1.20 for Part A and 1.02 for Part B.

EPOXY TECHNOLOGY		EPO-TEK® 353ND Technical Data Sheet High Temperature Epoxy	
Number of components:	Two	Frozen Syringe	
Mix ratio by weight:	10:1	1.18	
Specific Gravity:			
Part A	1:20		
Part B	1.02		

Divide the number of weight parts by the respective density:

$$\frac{\text{Weight parts PART A}}{\text{Density PART A}} = \frac{10 \text{ g}}{1.20 \text{ g/cc}} = \mathbf{8.33 \text{ cc}}$$

$$\frac{\text{Weight parts PART B}}{\text{Density PART B}} = \frac{1 \text{ g}}{1.02 \text{ g/cc}} = \mathbf{0.98 \text{ cc}}$$

This yields a volumetric mix ratio of 8.33 : 0.98, which can then be normalized to a more convenient ratio. To create a ratio in the form of 100:b, divide the volume parts of Part B by the volume parts of Part A and multiply the result by 100.

$$\frac{\text{Volume parts PART B}}{\text{Volume parts PART A}} \times 100 = \frac{0.98 \text{ cc}}{8.33 \text{ cc}} \times 100 = \mathbf{11.8}$$

This yields a volumetric mix ratio of 100 : 11.8. The ratio can also be normalized to the form a:1 by dividing the volume parts of Part A by the volume parts of Part B.

$$\frac{\text{Volume parts PART A}}{\text{Volume parts PART B}} \times 100 = \frac{8.33 \text{ cc}}{0.98 \text{ cc}} = \mathbf{8.50}$$

This yields a volumetric mix ratio of 8.5 : 1

EXAMPLE TWO

EPO-TEK® H20E

Consider another example using EPO-TEK® H20E which has a mix ratio by weight of 1:1, and specific gravities of 2.03 for Part A and 3.07 for Part B.

EPOXY TECHNOLOGY		EPO-TEK® H20E Technical Data Sheet Electrically Conductive, Silver Epoxy	
Number of components:	Two	Frozen Syringe	
Mix ratio by weight:	1:1		
Specific Gravity:		2.67	
Part A	2.03		
Part B	3.07		

Divide the number of weight parts by the respective density:

$$\frac{\text{Weight parts PART A}}{\text{Density PART A}} = \frac{1 \text{ g}}{2.03 \text{ g/cc}} = \mathbf{0.493 \text{ cc}}$$

$$\frac{\text{Weight parts PART B}}{\text{Density PART B}} = \frac{1 \text{ g}}{3.07 \text{ g/cc}} = \mathbf{0.326 \text{ cc}}$$

This yields a volumetric mix ratio of 0.493 : 0.326, which, just as before, can then be normalized to a the form of 100:b by dividing the volume parts of Part B by the volume parts of Part A and multiplying the result by 100.

$$\frac{\text{Volume parts PART B}}{\text{Volume parts PART A}} \times 100 = \frac{0.326 \text{ cc}}{0.493 \text{ cc}} \times 100 = \mathbf{66.1}$$

This yields a volumetric mix ratio of 100 : 66.1. Normalizing instead to the form a:1 by dividing the volume parts of Part A by the volume parts of Part B gives:

$$\frac{\text{Volume parts PART A}}{\text{Volume parts PART B}} \times 100 = \frac{0.493 \text{ cc}}{0.326 \text{ cc}} = \mathbf{1.51}$$

This yields a volumetric mix ratio of 1.51 : 1



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