

What is epoxy resins crystallization?

Crystallization appears unannounced, yet this is not a quality problem. Often the contents of a container, a bottle or similar appears cloudy, hazy or, upon inspection, even solid. By definition this appearance is described as a phase shift from a liquid to a solid state. It is similar to the shift from water to ice or vice versa. The crystallization of epoxy resins is completely reversible, like the freezing/thawing transition of ice and water. Just as water is not changed by repeated cycles, the properties of epoxy resins also remain unchanged.

Signs of crystallization

Crystallization appears in the form of cloudiness, floating crystals, crystal lumps or complete solidification. As the crystals have a higher density than the liquid resin, they sink to the bottom of the container. At the start of crystallization the resin begins to be cloudy, hazy and ultimately milky white. The white sediment begins to build up, densifies and spreads out, typically from the container bottom to the respective side walls. Finally, the entire container content takes on this structure. Once solidified, the crystallized epoxy resin can be permanently stored in this condition.

Why does crystallization occur?

Many plastic resins, including epoxy resin, are undercooled liquids. They are really solid at room temperature, but remain in a liquid state. Liquids undercool because their crystallization is a slow process or no seed crystals are present. In general, undercooled liquid resins have a natural tendency to crystallize at low temperatures. Other factors such as extreme cold, vibrations and temperature change can cause the material to crystallize.

Causes of crystallization

Crystallization is difficult to predict or completely rule out. It can happen coincidentally, without warning, and may only affect one part of a production batch (it is therefore normal for several containers from the same batch to demonstrate different degrees of crystallization).

Problem solving

Crystallization is more of an inconvenience than a problem. Heating the resin for 2-3 hours to 50-60°C is sufficient to melt the crystals. Before cooling back down to room temperature, it is important to make sure that all crystals have melted and can no longer act as seed crystals. To do so, carefully inspect the sides, the bottom and the area of the cap for any signs of crystallization. It is recommended – where possible – to clean the cap and the bottleneck with a solvent (IPA or acetone) after each removal.



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