



## PRINTING SUPPORT FREE WITH »TwoCure«

### Task

Resin-based 3D printing typically requires support structures on the printed object, structures that support overhangs and enable complex components to be built. On the one hand, these structures require preparation in CAD, and on the other, they have to be laboriously removed after printing. For these reasons, they cause additional manual work, avoidable waste and a poorer surface. Previously, support structures were essential because the often filigree plastic structures must be supported and connected to a build platform.

### Method

The »TwoCure« process developed at Fraunhofer ILT works in a similar way to stereolithography with photolithographic exposure, which triggers the layer-by-layer curing of liquid resins. In addition, the materials are solidified by cooling them below their glass transition or melting point. This is achieved using materials specially developed for this new technology and an adjustment of the process.

- 1 »TwoCure« system: cooled process chamber with dosing unit and high-resolution UV projection (50 µm, 2580 x 1650 pixels).
- 2 »Freeing« the components by melting the frozen block in the TwoCure process.

### Results

The light engine (UV) projects the layer geometry of the component onto the (still) liquid resin layer, which irreversibly cures at the exposed areas. Due to the cooled environment (installation walls, process space and platform), the surrounding resin areas are solidified by »freezing«.

In this manner, the hardened structures can »float« support-free in the entire 3D build volume. The curing of the material is done chemically by light and the solidification of the surrounding material thermally by cold. The name »TwoCure« reflects these two types of hardening. Because completely frozen blocks are created, they can be ejected from machine and then a new print job can be started, all of which greatly simplifies the automation of the process. The components are »freed« in the last step by melting the frozen block.

### Applications

The TwoCure technology is interesting for all companies that produce individual small plastic parts in large quantities or small batches. In the future, a TwoCure system can be used, for example, to automatically manufacture more than 100 individual earmolds for hearing aids, molds for jewelry production or small series for plastic components.

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