

Using D-Limonene to Dissolve 3D Printing Support Structures

What Is D-Limonene?

d-Limonene is the oil pressed from the rind of citrus fruits (usually oranges) when they go through the juicing process. Once the juice and oil are pressed out, they are separated and the oil is distilled to recover certain fragrance and flavor compounds. There are two types of d-Limonene available after this initial process: “Food Grade d-Limonene” and “Technical Grade d-Limonene”.

Food grade d-limonene is gathered in bulk after it has been separated. **Technical grade d-Limonene**, however, has a secondary process in addition to the first separation process.



The peels are sent to a steam extractor where more of the oil is extracted from the peel. When the steam is condensed, a layer of oil floats on top of the water’s surface. The oil is collected and bottled as technical grade d-Limonene.

Printing With Dissolvable Support Structures

If you use a dual-extruder machine, like the **MakerBot Replicator 2X**, you can print in a material called HIPs (High Impact Polystyrene) or with MakerBot’s dissolvable filament. This filament dissolves in d-Limonene and can help with complex prints. There are a few things that you have to keep in mind with this filament: It prints at a slightly higher temperature on the MakerBot, 250°C, and requires the heated build plate to be on to 110°C.

There are a few things that you have to watch when printing with this material. HIPs warps very easily if you don’t use helper disks or wipe own the build platform (BP) with alcohol or an acetone slurry. So what we recommend is that you print-preview the print and figure out where the support structures are going to meet the BP.

Once you figure this out, import a helper disk and let the helper disk sit in the same spot as where the support structure will touch the BP. This will reduce the chances of the support structure lifting off the BP by increasing the surface area. We have used this trick numerous times and found it to help a lot! Another trick to do is wipe down the BP with some isopropyl alcohol prior to printing. We do this before every print (whether it’s ABS or HIPs) as it helps get the oil ABS creates off the platform.

Working With D-Limonene

Using, disposing, storing and handling of d-Limonene can be a bit tricky. d-Limonene does not play well with other plastics. For instance, it will deform and break down a Solo cup within a few hours. So what are the best practices for using this chemical? This is what we recommend:

Storing: This chemical should be stored in a phenolic-lined container or fluorinate plastic container. Store in a well-ventilated area and the storage temperature should not exceed the flash point (122°F).

Handling: Use proper protective gear while handling d-Limonene. Always double check the MSDS sheets for any more information on the product.

Using: When using d-Limonene to dissolve supports, place the chemical in a glass jar or container that has a sealable lid. After this place the print into the jar and seal the lid tightly. Make sure that you label the jar so a child or adult doesn't confuse the liquid to be something else!

Disposing: When disposing of this chemical there are a couple ways you can go about doing this. Due to the lower flash point of the chemical, there may be state regulations. The first way is dump it down the drain **IF AND ONLY IF**, you have talked with your local city health officials to see if that is legal. Also, if you live in a rural area and use a septic system, this chemical can damage the bacteria within the tank which could cause thousands of dollars in damages to the drain field; so we recommend **NOT** disposing it in this fashion. The second, and best, way is to take it to the local household chemical disposing facility. Always check with your local, state, and federal health officials to see what the best practices are for disposing in your area.

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