



3D Printing on Diffraction Grating Sheets

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<https://learn.adafruit.com/3d-printing-on-diffraction-grating-sheets>

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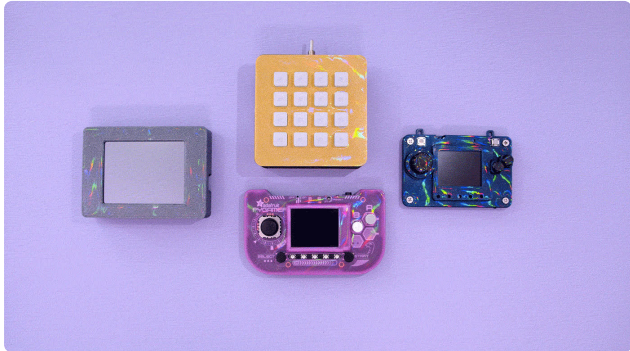
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Overview



In this project we'll show you how to get iridescent effects on 3D printed parts.

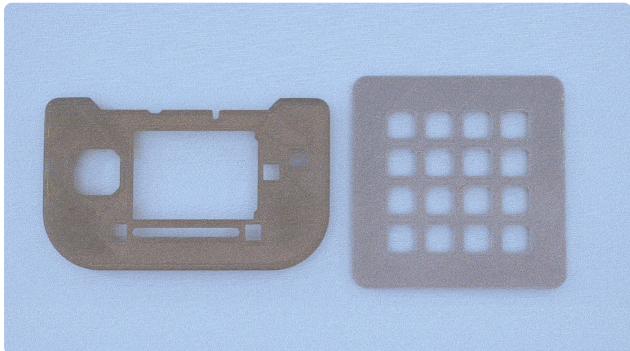
You can get shiny rainbowlike surfaces on the bottom your 3D prints by printing on a special sheet.

In direct light, reflections look iridescent with rainbowlike patterns.

We think this works great for project enclosures, cases and faceplates.

These are diffraction grating sheets and they're are mostly used in optics.

This film can have different number lines per millimeter and this actually splits light into separate beams of color. We used the Double Axis Diffraction Grating sheet 13,500 lines/inch.



The Single Axis sheets did not transfer any diffraction features.

This stuff has tons of applications from creating laser light shows to making spectrometers.

So you can get a roll of this stuff online and use it for making DIY arts and crafts.



Surface finishes

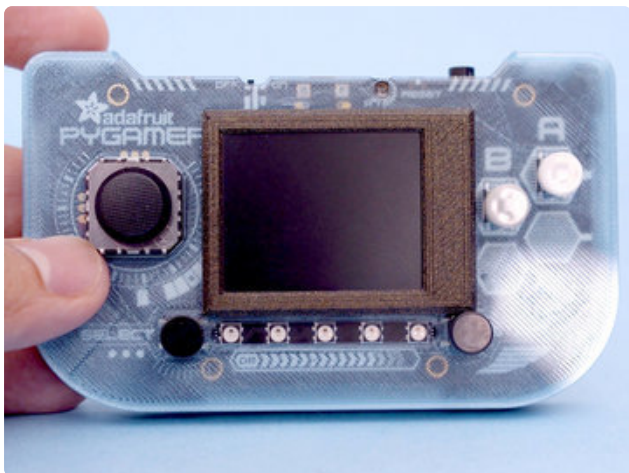
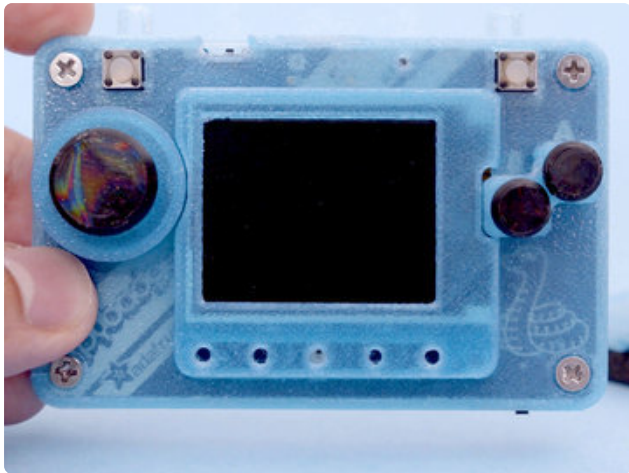
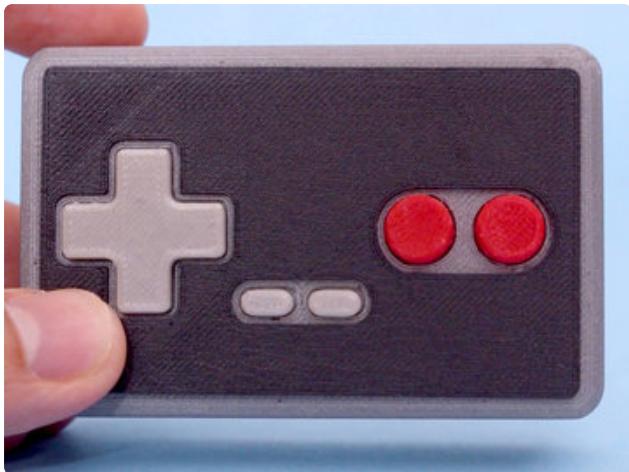
We can achieve different surface finishes by printing on different types of material. When filament is extruded it takes the features and characteristics of the surface it's lay on, like a mold!

Diffraction grating sheets give a mix of a matte finish with glossy reflections.

Blue tape gives a matte finish with a leather like texture.

Heated glass offers shiny reflective surfaces that look and feel glossy.

Powder coated PEI leaves a curse looking texture with a matte finish.





Filament for 3D Printers in Various Colors and Types

Having a 3D printer without filament is sort of like having a regular printer without paper or ink. And while a lot of printers come with some filament there's a good chance...

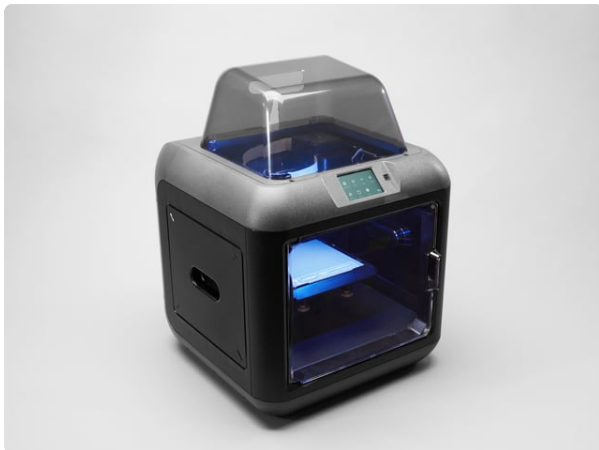
<https://www.adafruit.com/product/2080>



Ultimaker 2+ 3D Printer

The Ultimaker 2+ is one of our favorite 3D printers on the market. It's a well-built open-source compact machine with an excellent UX. Every inch of the...

<https://www.adafruit.com/product/2673>



Monoprice Inventor II 3D Printer with Touchscreen and WiFi

The Monoprice Inventor II 3D Printer Touchscreen with WiFi is a perfect entry-level 3D printer with small footprint and reliable performance. It comes equipped with...

<https://www.adafruit.com/product/3897>

1 x Double Axis Diffraction Grating sheet
13,500 lines/inch

<https://www.amazon.com/gp/product/B007FZXNL6>

Author Notes

This technique was inspired by David Shorey ([instagram \(https://adafru.it/FcM\)](https://adafru.it/FcM), [twitter \(https://adafru.it/FcN\)](https://adafru.it/FcN)). Follow David on social media to see more work and inspirational experiments.

3D Printing

Quick Material Testing

The fastest way to test different filaments is to print directly on the film with a 3D printing pen.

ABS, PLA, and Ninjaflex 85A all worked perfectly in our tests!

This also gives a good indicator for printing on the correct side of the sheet.

Diffraction Grating Sheet Types

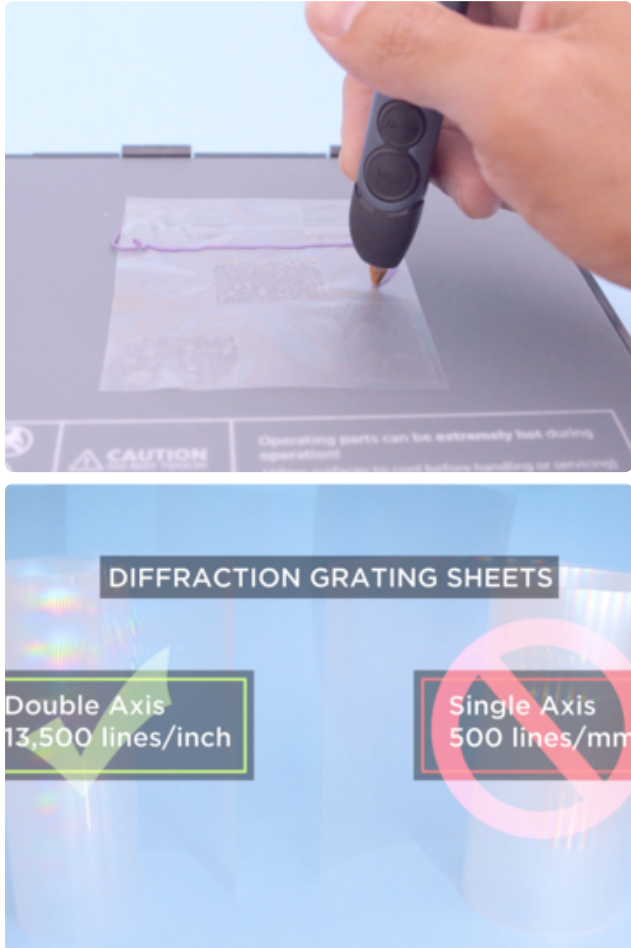
These are diffraction grating sheets and they're mostly used in optics.

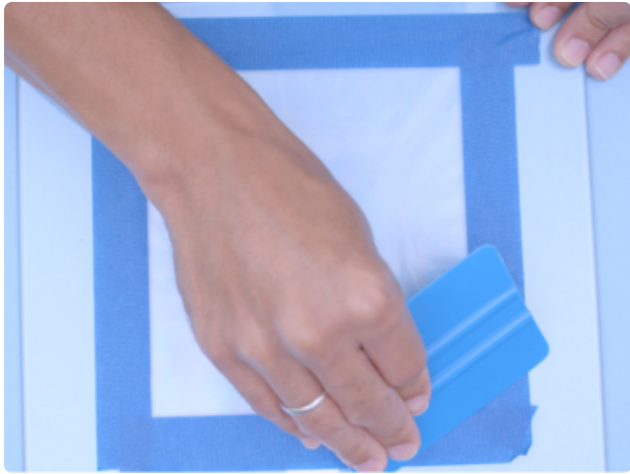
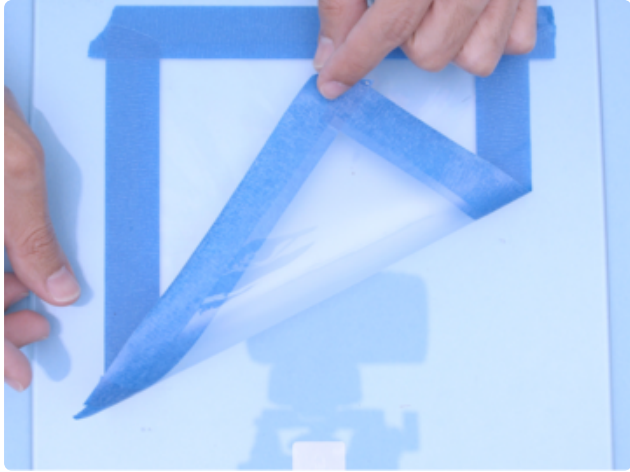
This film can have different number lines per millimeter and this actually splits light into separate beams of color.

In our tests we're using the double axis Diffraction Grating sheet. This has 13,500 lines per inch.

The single axis sheets did not capture any of the texture. This has 500 line per mm.

We suggest using double axis sheets with at least 10,000 lines per inch.





Sticking Diffraction Grating Sheets the Bed

Cut sheets to fit the size of your bed. We used blue painters tape to adhere the sheet to our glass bed.

The side with a matte finish should face up – shiny side down.

Longer strips around the edges will keep the film down while printing.

We suggest using a window squeegee to knock out any tiny air bubbles.

Window Spray

Another option is to applying water or a glass cleaning solution over the glass bed. Lay a sheet over the bed and squeegee the surface. This technique is commonly used for sticking sheets to windows.

3D Printing on Diffraction Grating Sheets

When printing, the texture of the diffraction grating is captured in the first layer!

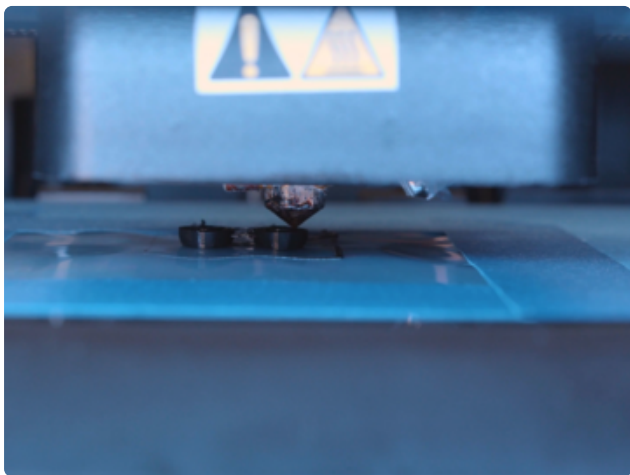
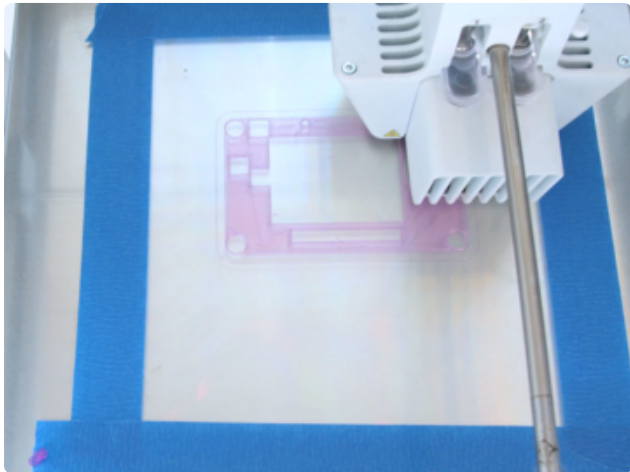
We didn't have to level using active leveling on the Ultimaker 3.

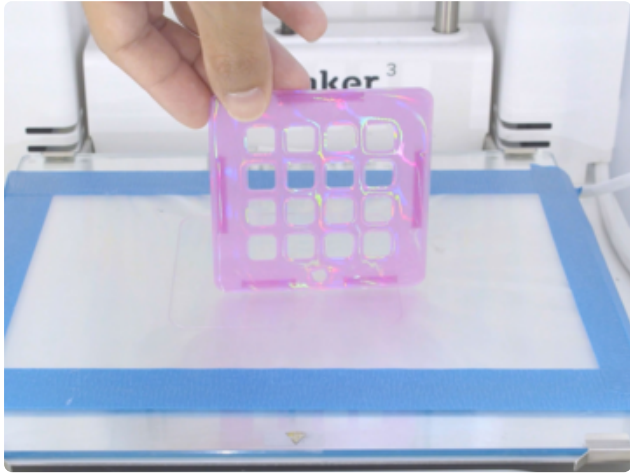
We did adjust the first layer height to .18 instead of the default setting of .27 which turned out to be too high to adhere to the sheets.

We heated our bed to 60C. We used transparent PLA filament to make a case for an Adafruit PyBadge!

Flexible Materials

Flexible materials works too! We tested Ninjaflex 85a on a non-heated bed. We releved the bed so the nozzle isn't so close to the sheet. The default flexible material settings worked perfect. Make sure to have the first layer height set higher to around .3mm to avoid fusing to the part.





Removing 3D Prints from Diffraction Grating Sheet

Parts stick really well without being too difficult to remove. It's easy to remove parts while still warm or we can wait until the bed cools down.

This worked with both flexible materials and PLA.

With flexible materials, if the nozzle is too close to the sheet, the material and sheet will completely fuse together.

Minimal surface area

While printing our buttons we noticed the smallest surface area that will imprint diffraction features is around 5mm diameter. Smaller parts will not imprint any of the diffraction features.



Colors

We found that darker colors will really bring out the bright rainbow color shine in parts.

Translucent filament with dark colors saw the same contrast in the rainbow shine. Light colors still captured the diffraction features but just don't pop like the darker colors do.



So what ideas do you have? How would you use this technique in your projects. You can let us know by attending the [Adafruit Show and Tell live stream on Wednesdays \(https://adafru.it/FbW\)](https://adafru.it/FbW)!