

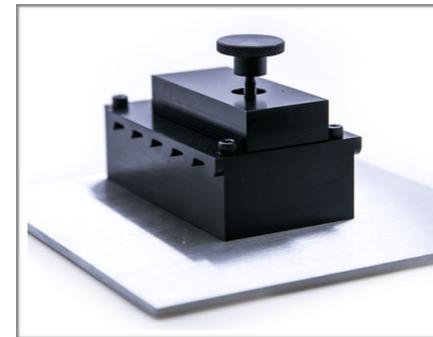
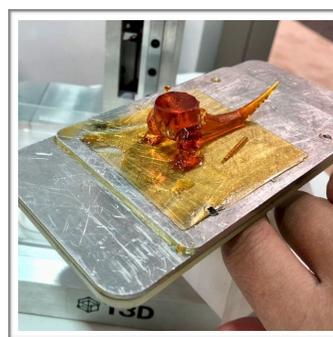
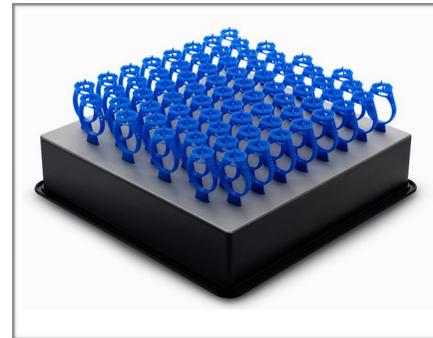
WHITEPAPER

MONOCURE 3D – UNDERSTANDING BUILD PLATE ADHESION



There is nothing worse than waiting for 7 hours for your 3D resin print to finish, only to discover there is nothing on the build plate. I think it's one of life's most disappointing moments, possibly worse than missing out on that big promotion at work, not making the team or failing your driving test! Ok, it's not that bad, but at the time it feels annoying and frustrating. It makes you feel that the last 7 hours were a waste of time. If you are 3D printing for business, then every failure is more than just annoying & frustrating...it's actually costing you money!

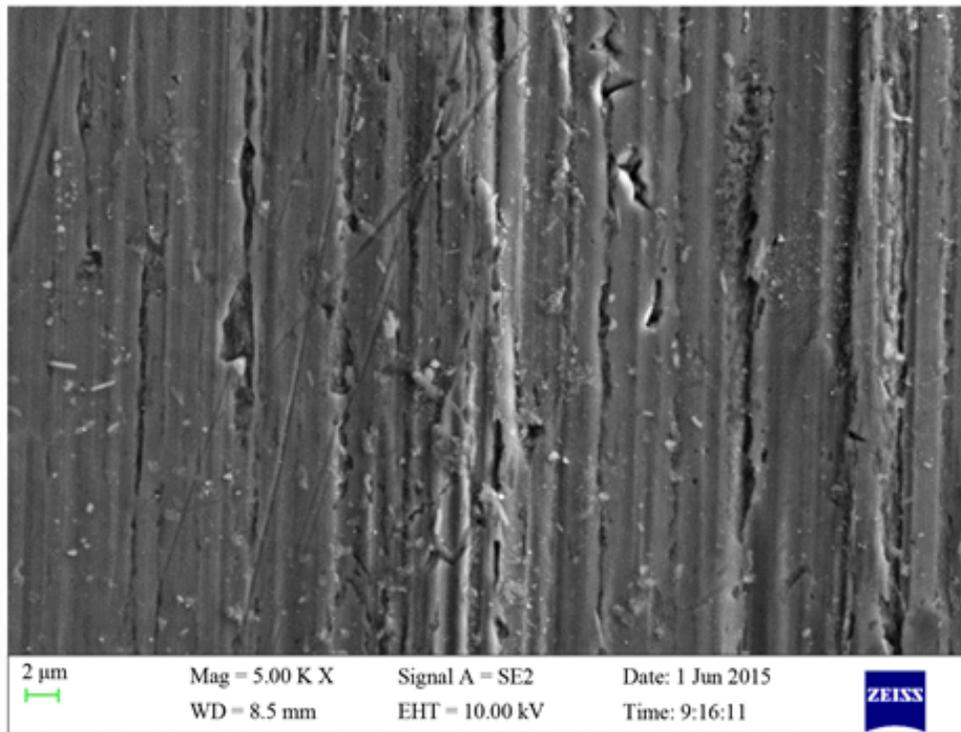
As you can see by these pictures below, resin 3D printer build plates come in many shapes and sizes. The one thing most of them have in common is the bare aluminium surface for the resin to adhere to. All but one, The Anycubic Photon (highlighted in red), more about that later....



The Anycubic Photon Build Plate

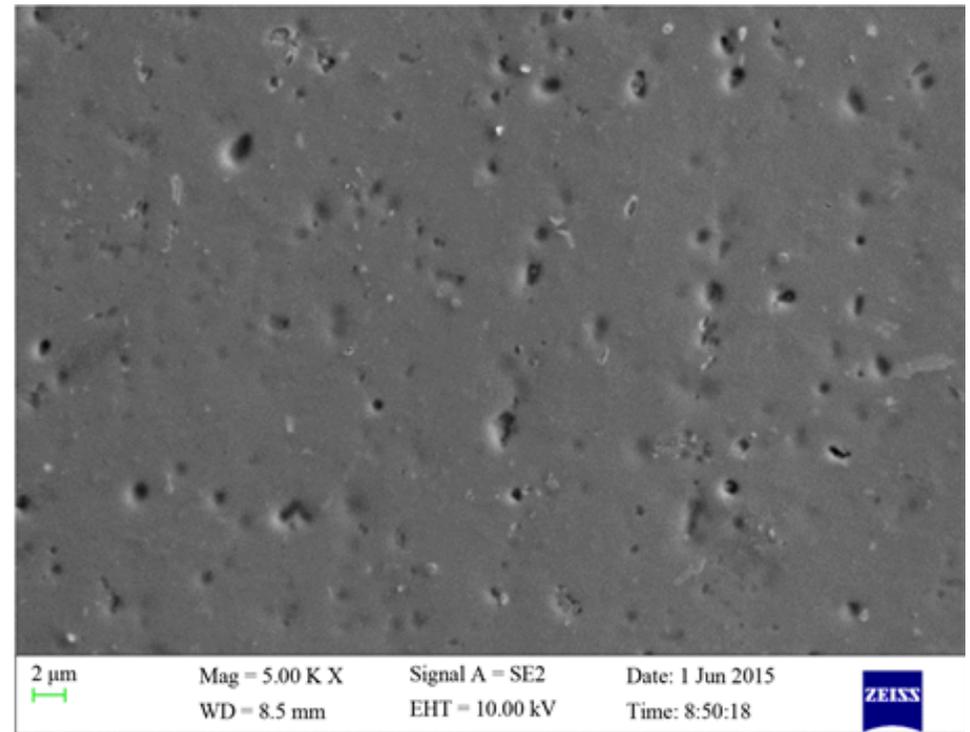
Why am I having problems with the resin sticking to the build plate?

Problems occur when the first few layers of the resin do not stick to the build plate. Actually, the first is really the most important! When the liquid resin comes into contact with the build plate it needs to get into as many of the aluminium's natural pores, cracks and crevices. When the first layer is cured with the reaction of the UV light setting off the resin, similar to a 2 pack epoxy glue, but rather than the liquid hardener causing the reaction, it's the UV light and photo-initiator doing the work. (More on this in another White Paper perhaps?!) The important thing to remember is the resin needs the best surface possible to adhere to. Imagine how many times a 22-hour print goes up and down, that is a lot of pressure on those first layers to stay stuck. You can see in the 5000 X magnification below, the difference between a raw aluminium surface (a) and a polished aluminium surface (b). You can imagine what then powder coating that already smooth surface would do?!



(a)

(a) Raw & Uncoated Aluminium 5000 X



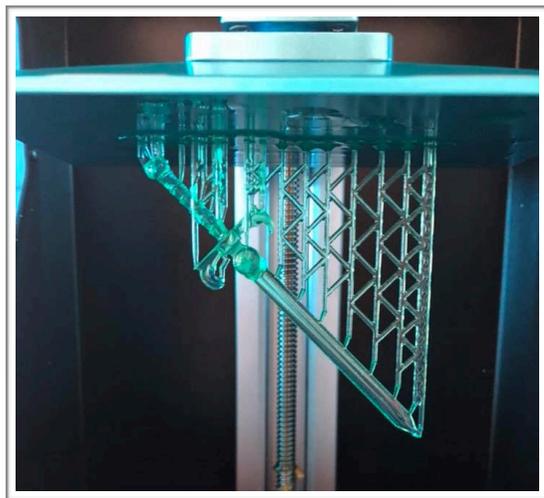
(b)

(b) Polished Aluminium 5000 X

What is powder coating? (Thanks Wikipedia!)

Powder coating is a type of coating that is applied as a free-flowing, dry powder. The main difference between a conventional liquid paint and a powder coating is that the powder coating does not require a solvent to keep the binder and filler parts in a liquid suspension form. The coating is typically applied electrostatically and is then cured under heat to allow it to flow and form a "skin". The powder may be a thermoplastic or a thermoset polymer. It is usually used to create a hard finish that is tougher than conventional paint. It is designed to repel liquid to stop the surface from corrosion, what chance does a resin have sticking to that?

Why does the Anycubic resin work?



Clear or a translucent resin will have the best opportunity of adhering to a polished or painted surface. This is because the UV light has the best possible chance of curing through the resin and creating a strong bond to the plate.

It's important to understand the difference between a dye and a pigment. Dyes and pigments are substances that impart colour to a material. The term colorant is often used for both dyes and pigments. The major difference between dyes and pigments is the particle size. Therefore dyes are not UV stable whereas pigments are usually UV stable.

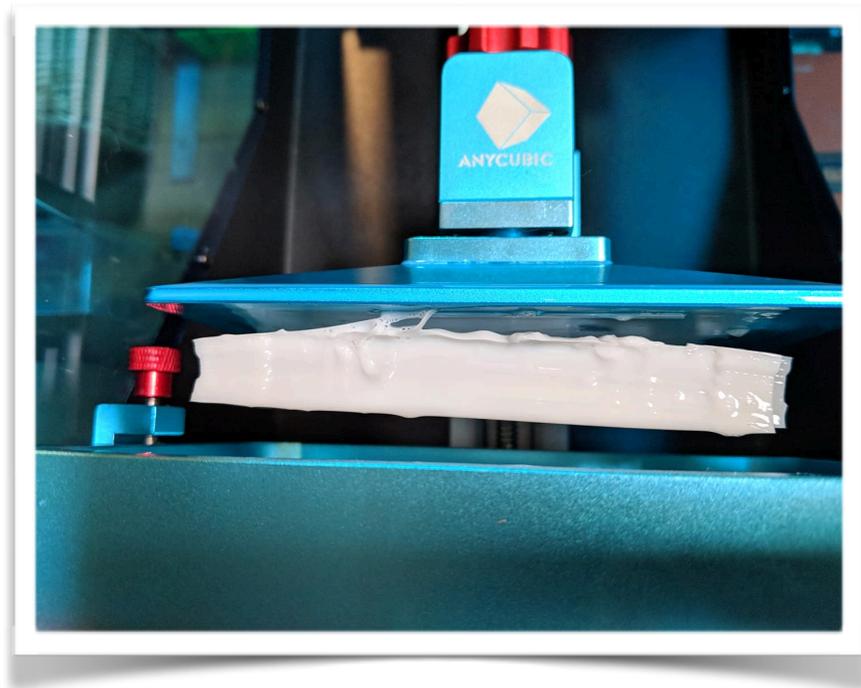
At Monocure 3D, we use pigments for all our colours. These are much more expensive and a superior product to a dye. Pigments will last much longer without fading on ageing and have the ability to give that nice solid, smooth finish.

So you have an Anycubic Photon and you are having print failures? Especially with the Monocure 3D pigmented resin? Well, I'm not surprised! Let me fill you in on what happened over in the Wanhao Duplicator 7 camp. Wanhao first produced the Duplicator 7 with a bare aluminium build plate. Then with the release of a newer model, they decided to powder coat the build plate black. All of a sudden, there were complaints coming from all over the world that the resin was not sticking to the build plate and I had lots of angry customers! We had to react by reducing the pigment strength in our resin, this was to help with the through cure and bonding properties onto the newly painted surface. (Continued next page)

We managed to alleviate the problem, but most of the community decided to remove the black coating from the build plate to ensure the best possible bond between the model and the plate. Many of us pleaded with Wanhao (I think I was one of the loudest!) to stop powder coating the plates and go back to the original bare aluminium style that we knew worked so well. Thankfully, they listened and now the latest version comes with a bare aluminium plate (unfortunately it's polished, but that is another story!)

What does poor adhesion look like?

Below are some common photo's I see on the Photon Facebook group and appear in my email in-box.



What can I do to fix this problem?

It's so simple, you just need to remove that blue paint from the build plate. This is best done by using masking tape to stick a piece of 240 grit sandpaper to a completely flat surface (Glass is perfect), then rub your build plate back and forth until all the paint is removed. Using an electric sander is not recommended as it could make the build plate surface uneven and not completely flat. I understand your reluctance to sand the build plate. It's just so frustrating that anycubic decided to paint it! All of the other brands have bare aluminium build plates for a very good reason, to get the best adhesion possible. Remember to re-home your printer after you have done the paint removal process as per manufactures instructions.

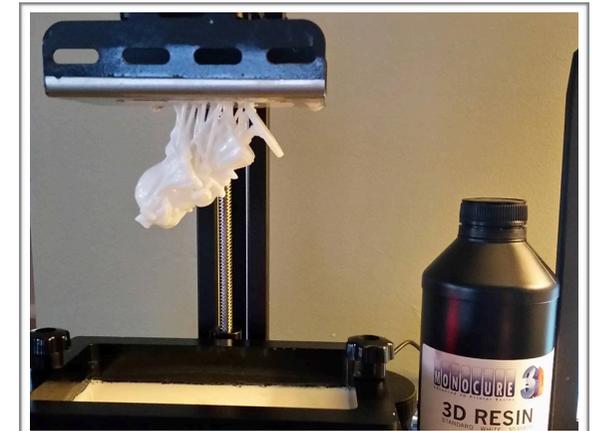
I really don't want to sand my build plate - It's a new printer, and it looks so pretty...(insert memories of failed prints here!)

Ok, so I still haven't convinced you to sand your build plate? There are a few other things you can try.

1. Reduce your layer height. By doing this, you will make the amount of resin to be cured thinner, therefore reducing the amount of pigment your light has to travel through.
2. Dilute the pigmented resin. If you have clear resin you can mix in some clear resin to further dilute the pigment. The more you add the more transparent it will become. If you add too much of the clear resin, you may find the pigments settling more easily in the vat. Try up to 25% of clear to see if this helps.
3. Check your model positioning. Avoiding large flat areas coming in contact with the FEP. This can create a suction effect that places greater pressure on the model. Avoid using rafts, use thick supports and a 45D angle when positioning the model.

Conclusion

A picture tells 1000 words...Below are some images of our pigmented resin adhering very well to bare aluminium build plates!



I really appreciate the time you have taken to read this. This is a new and exciting industry and we all need to help and support each other. If you are on social media or hear a friend, colleague or stranger that is having adhesion issues, please send them a copy of this report or pass on your new found knowledge to them.

Happy Printing!

Charlie

Disclaimer

- This disclaimer governs the use of this WhitePaper. By using this guide, you accept this disclaimer in full.
- This Paper has been written for the purpose of assisting people who are having issues with build plate adhesion.
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