

Further adventures with a 3D printer - Stereo polarising microscopy!

I recently came across an excellent article over on the Microscopy Facebook group whereby a member produced some excellent polarised images using a vertical illumination setup on his compound microscope. This is a different use of polarisation as it relies on reflected light (incident light) hitting the sample from above and not from below through transparent objects like slides on a compound scope.

I posted this in another forum asking how it might be achieved and James (Labrat178 on the forum and a contributor to this magazine) advised that he had setup his stereo scope to do polarised imaging.

The stereo scope that James uses has a central light for illuminating objects from above and he successfully used polar film with this setup for polarisation.

My scope does not have a central above light source only two gooseneck spots and thus not so straightforward to adapt.



After some thinking I remembered I had a little used ringlight which I thought would give me the above light source which could somehow contain the initial polarising film. As others will know, to achieve cross polarisation requires two polar filters - one fixed the other rotatable to get extinction. And so after firing up the CAD software and then my trusty 3D printer this design came about!.



The idea being (not quite as expected as it turned out!) that light from the LED's would go down through the rotatable filter (2nd polariser) hit the specimen and bounce back up through the filter fitted into the head of the scope and thus view the specimen under polarised light.

Well the experiment didn't quite turn out as expected and focusing an image of my steel ruler under normal light I slowly turned the bottom ring containing the polarised film and suddenly everything went black, extinction seemed to have been achieved but no image at all of the ruler?? After much head scratching I asked on my usual forum what I might be doing wrong and one reply I had was that a similar commercial polarising ringlight had a cutout in the centre of the polarising film and

then it occurred to me that without a central cutout of the rotatable film I was cancelling out the initial filtering of the LED light. I was filtering the light 3 times!

Image before cross polarisation

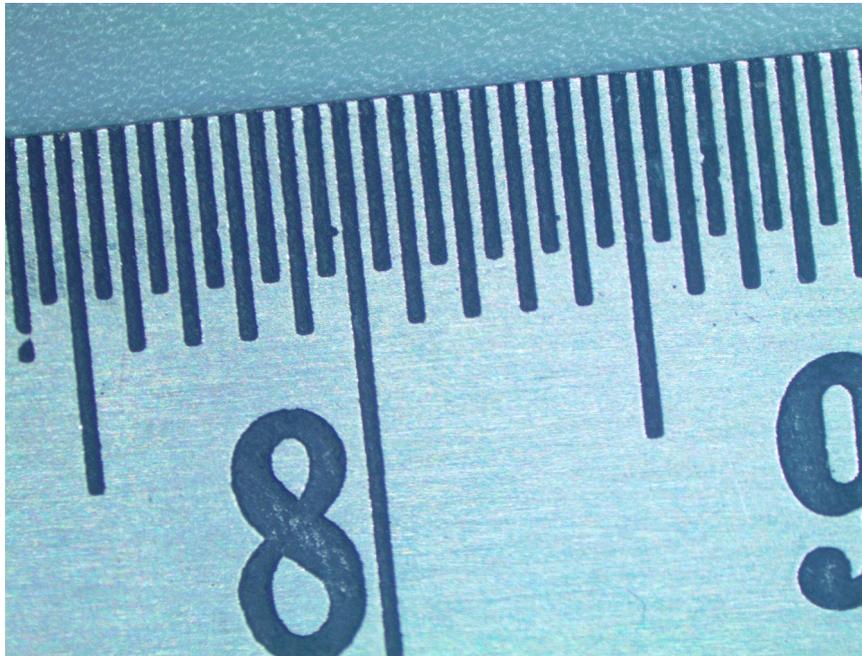
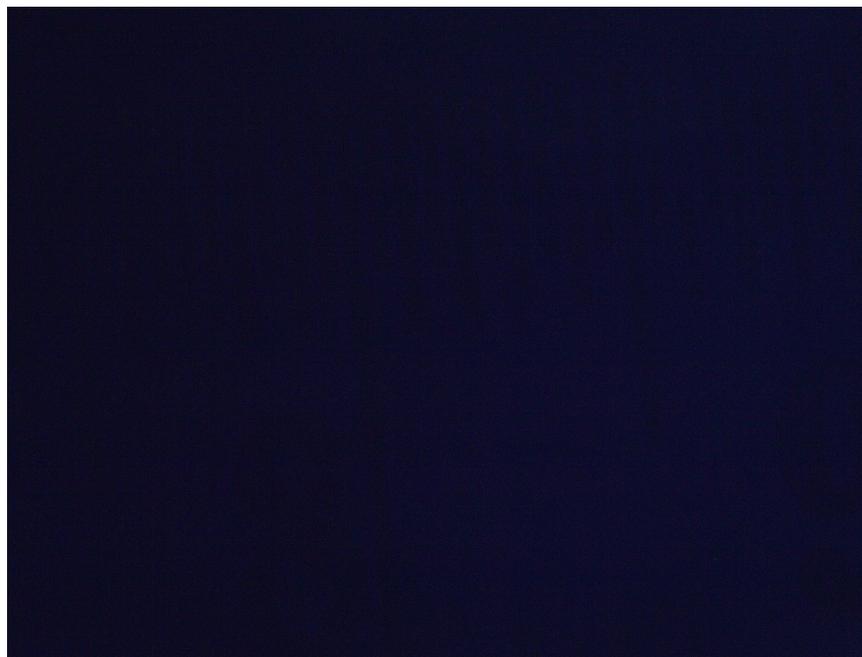


Image at cross polarisation before hole cut out of film



So back to the CAD software for Mk2 as the setup was not ideal for easily rotating the film I redesigned the holder and recut some polarising film with a central 50mm Hole.





Clipped onto the
ringlight



View from underneath

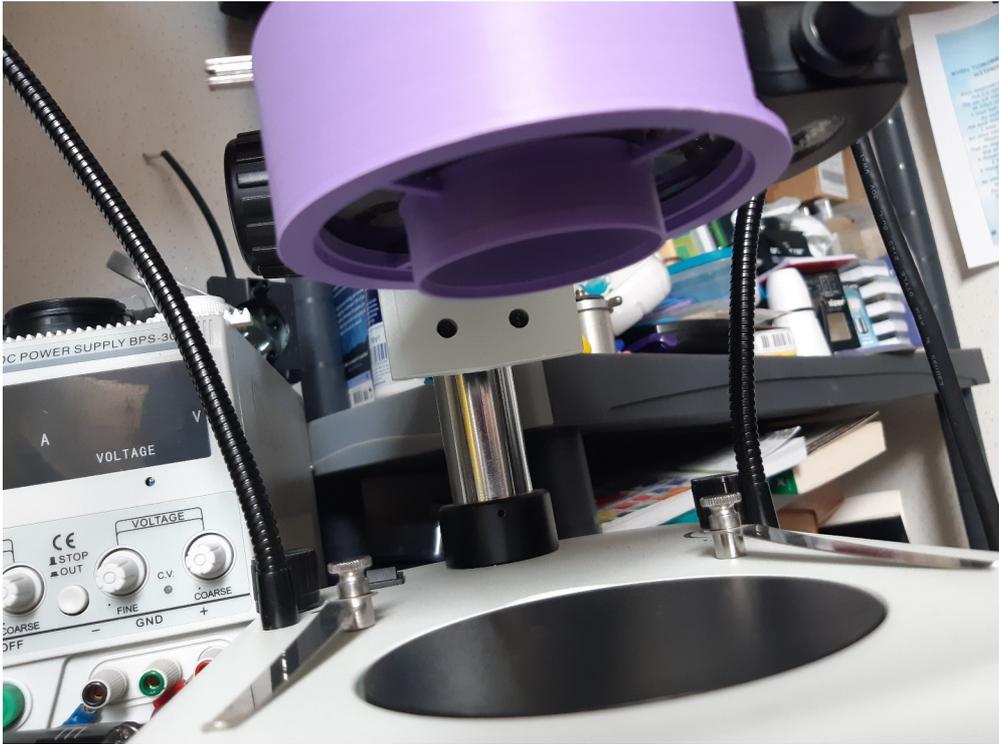


Image of pound coin no polarisation



Image at crossed polars

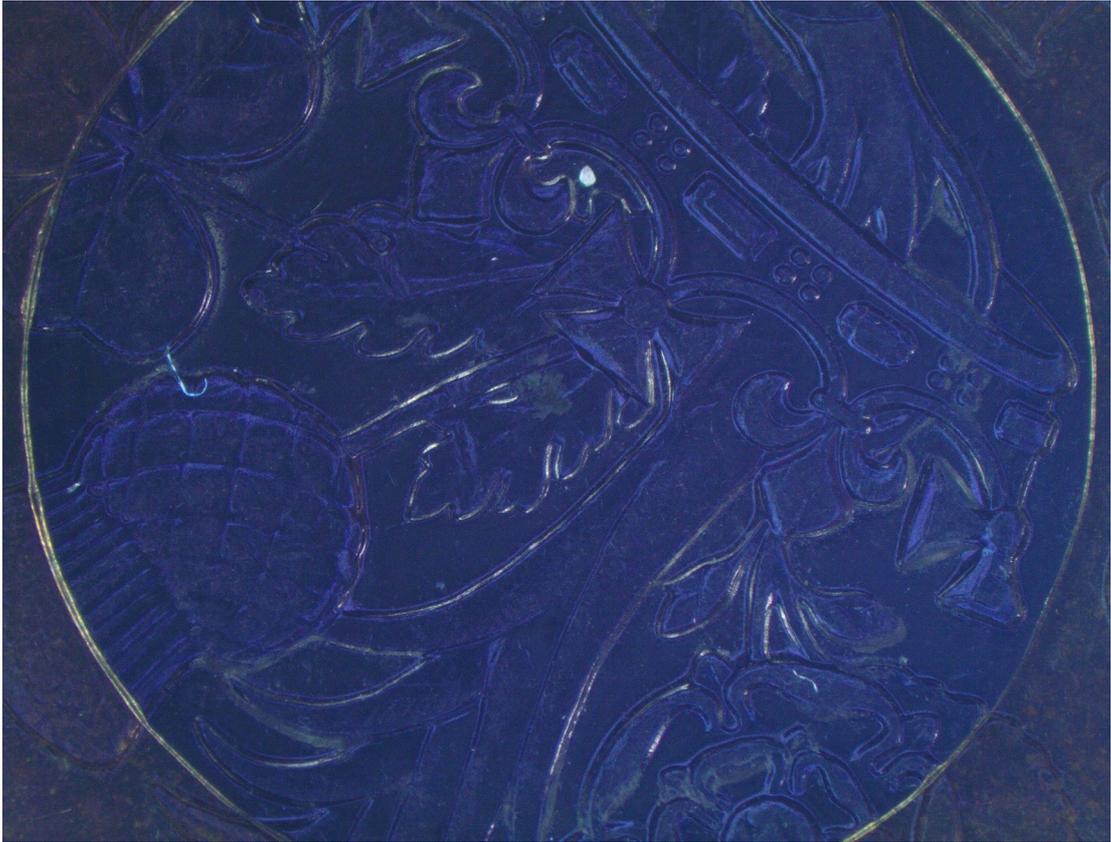
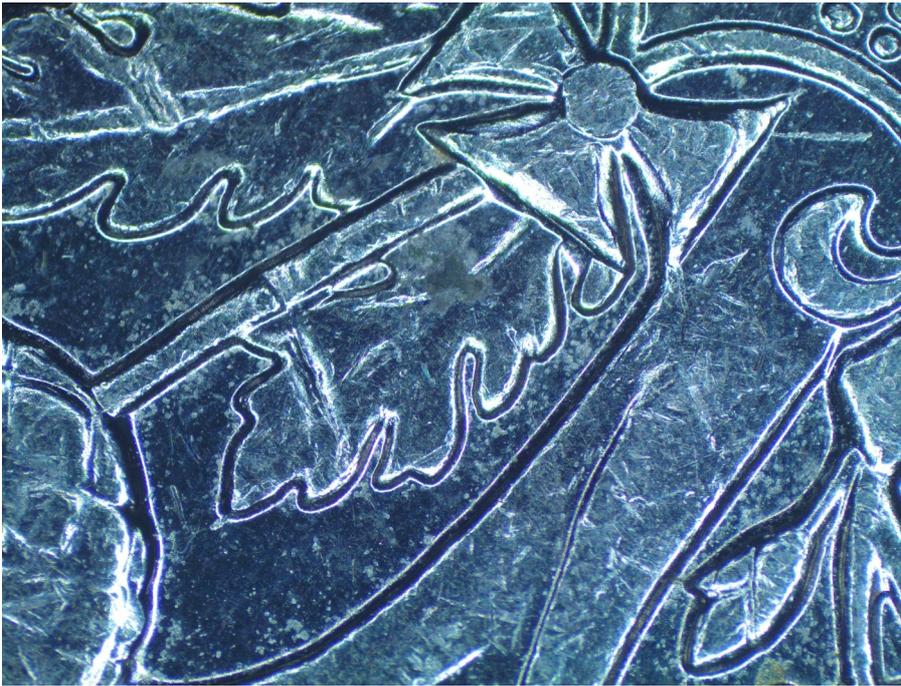
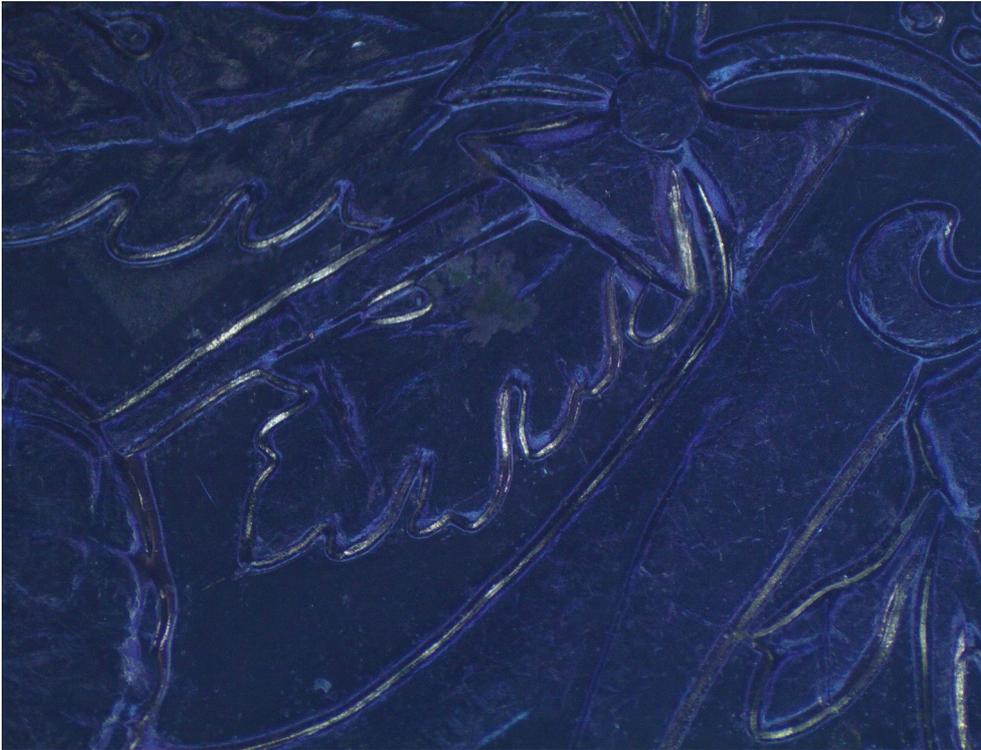


image of pound coin zoomed in without polarisation



Zoomed in image under crossed polars



So now it seems that polarization has been achieved and further experiments will include a way of adding retarders to the above setup and also some better samples to try it out.! All interesting stuff ;-).

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