NEAR INFRARED MICROSCOPY PART 2

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INTRODUCTION:

In a previous article I applied for the first time to microscopy my new camera with the property of allowing near infrared (NIR) spectrum to pass. I took advantage at that time of the NIR LED that comes integrated to the camera and that makes possible reflected NIR lighting of the macro world and that when applied to microscopy has the same capability with good results.

This is the camera:

It is said that the NIR spectrum is a kind of lighting that passes almost unchanged from some types of media to another. That property allows NIR lighting to be used to reveal hidden details in some objects when the proper equipment is used as in the case of a camera whose NIR cut filter has been removed or that is mechanically removed by clicking a button as in the case of my camera.

It is also said that a good source of the NIR spectrum is any “hot” lamp such as a tungsten lamp.

Inspired by the words below of an article by David Walker '**Quick look: Near infrared microscopy with a Nikon D50 DSLR compared with a B/W video camera**'

“… In principle, tungsten lighting with visible light filters may also work but haven't tried this. Any feedback from users on the efficiency of that approach would be of interest. …. Thanks to the readers who remarked that this route is very workable and has the benefit of retaining the normal microscope lamp. “

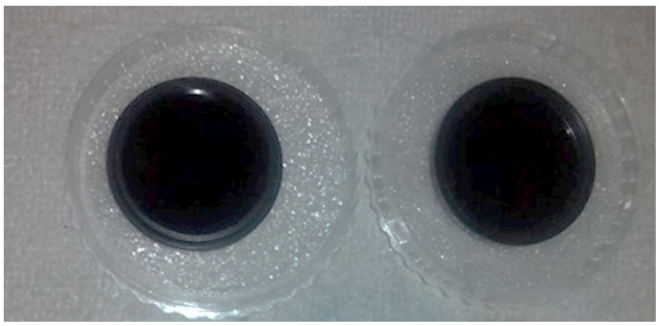
I tried this using the own tungsten lamp of my microscope and my camera with very good results, See below.

DEVELOPMENT:

Fortunately my microscope is equipped with a tungsten lamp so I decided to try it with my camera by turning on the NIR function that removes the NIR cut filter and by blocking the NIR LED with insulating tape as used by electricians. I proved that the LED is blocked by directing the camera with the NIR function turned on in a dark room and there was no reflected lighting, so it was totally blocked.

Then I placed the camera on the top of the microscope, for this I had to remove the head that holds the eyepieces.

The camera had in front one of the filters that blocked visible light and that just allow the pass of NIR radiation (it works even without the filters)



And setting it this way.

One advantage that I got with this approach is that it is possible to see under the lenses thick objects such as needles, coins, staples, etc that in brightfield would be difficult if not impossible to see.

But the question could be whether it is transmitted or reflected. I think it is both, transmitted because it used the lamp below the stage that regularly is used for transmitted observations.

It is also reflected because the lamp as it is a tungsten one creates an environment of light around the sample and within this light obviously is near infrared light that can reflect back upon the thick samples and that can be caught by the camera sensor without the NIR cut filter. Allowing in this way to observe thick objects such as coins, and reveal details that cannot be seen in brightfield.

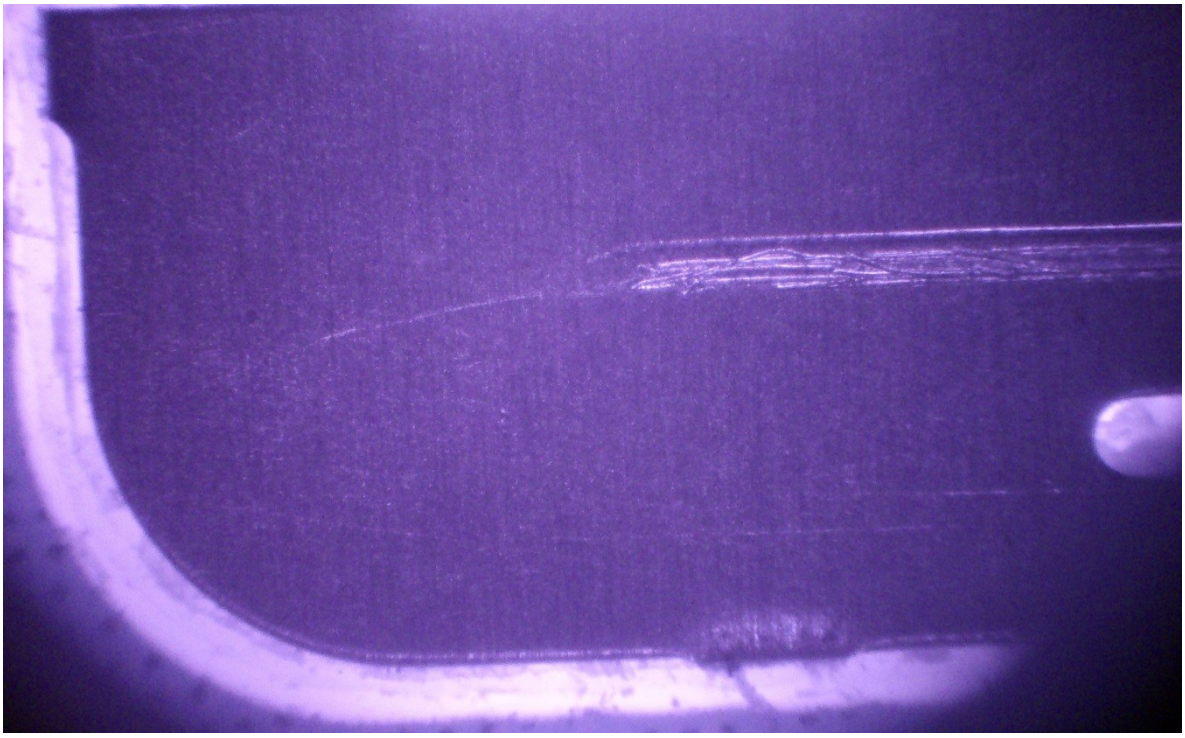
From further studies it is both reflected and transmitted because when I covered directly the beam of light with for example a coin the illumination disappeared showing this way that it was not solely transmitted.

The greatest advantage that I guess this approach has it that it works very well with metallic thick objects reveling details of their surfaces so this way it is possible to create a METALLURGICAL MICROSCOPE.

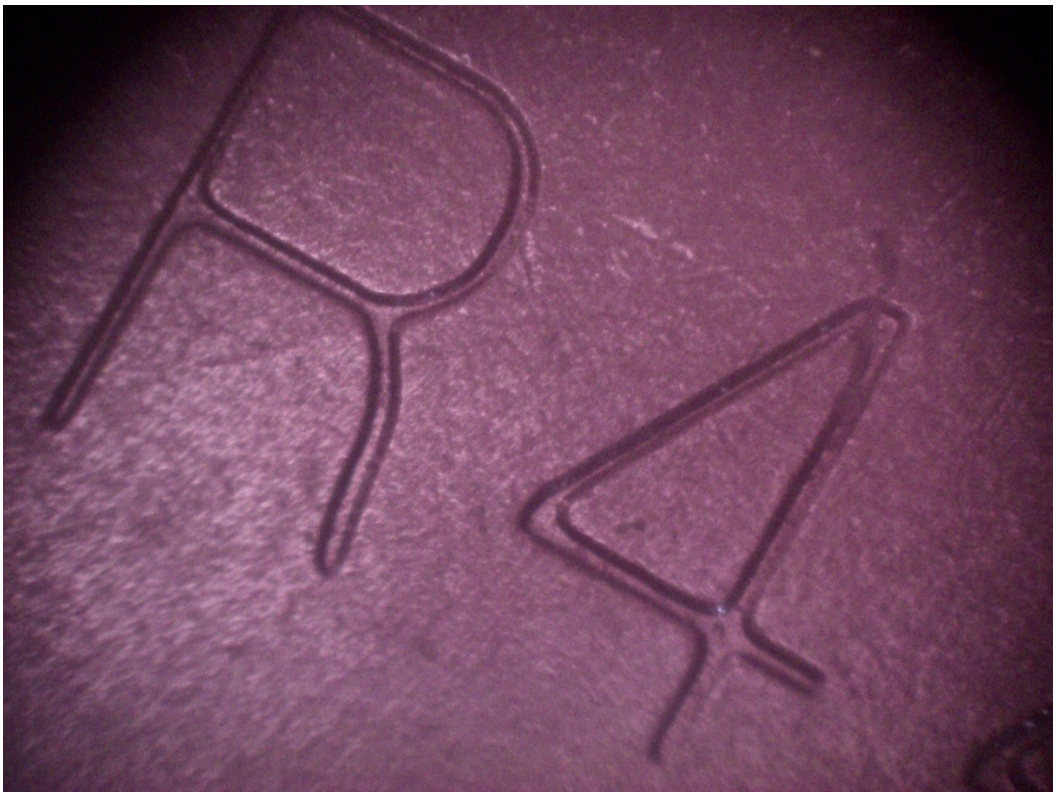
RESULTS:

Year of coining of a Mexican 50 cent coin 4x

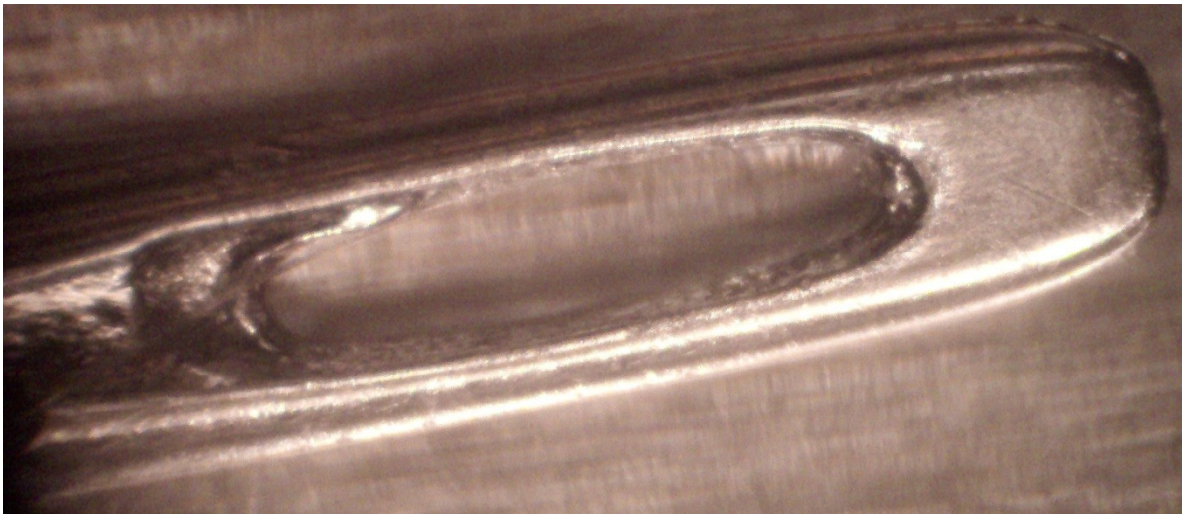
The symbol behind a Mexican 5 pesos coin 4x



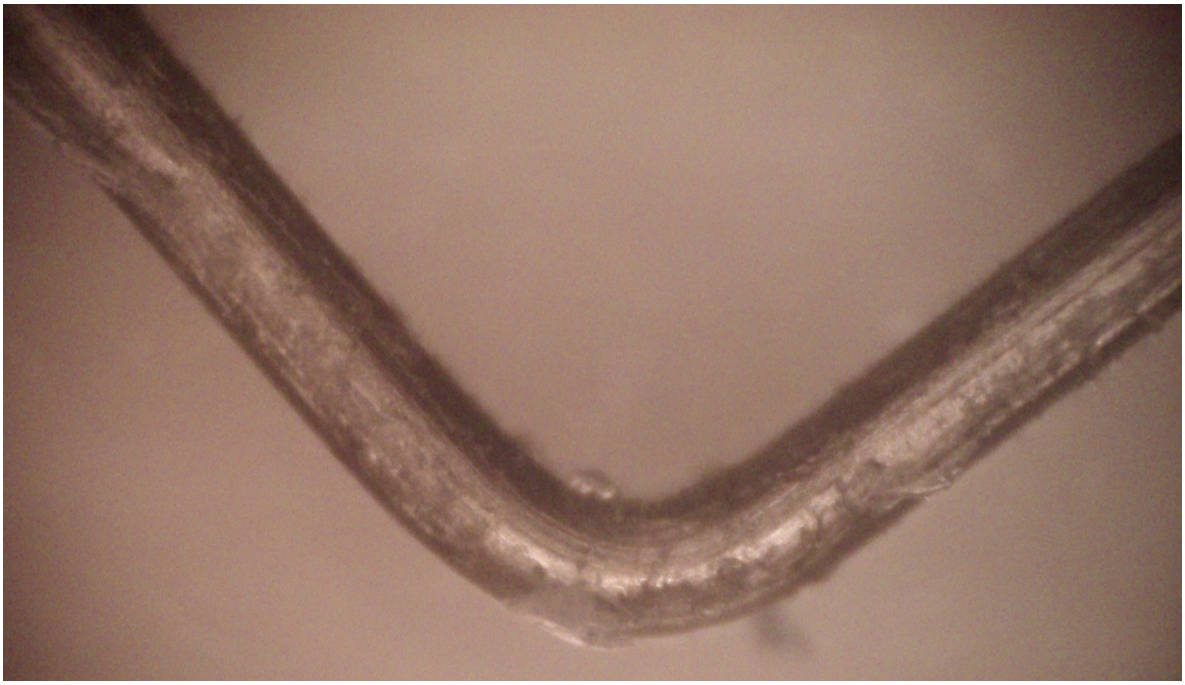
Part of a SIM card 4x



Part of a small button battery 4x

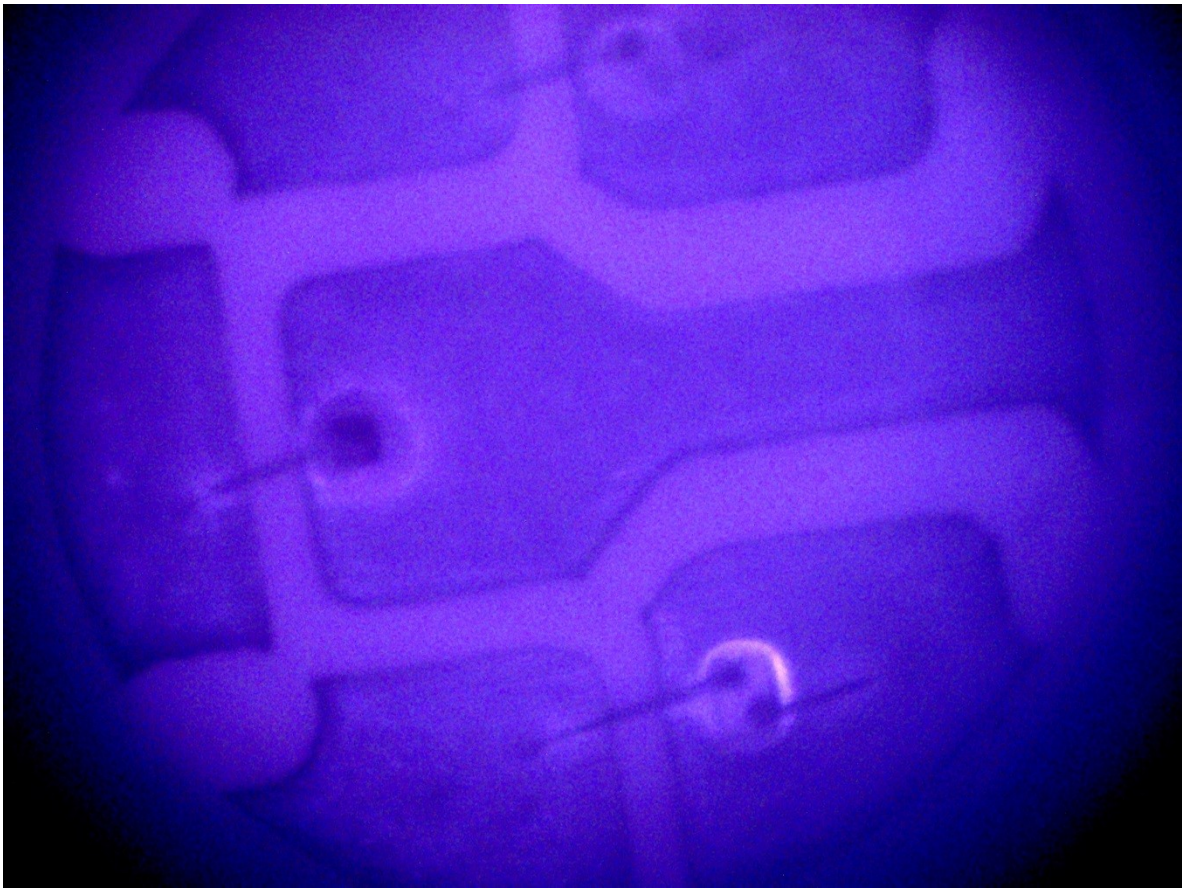


Eye of a needle 4x

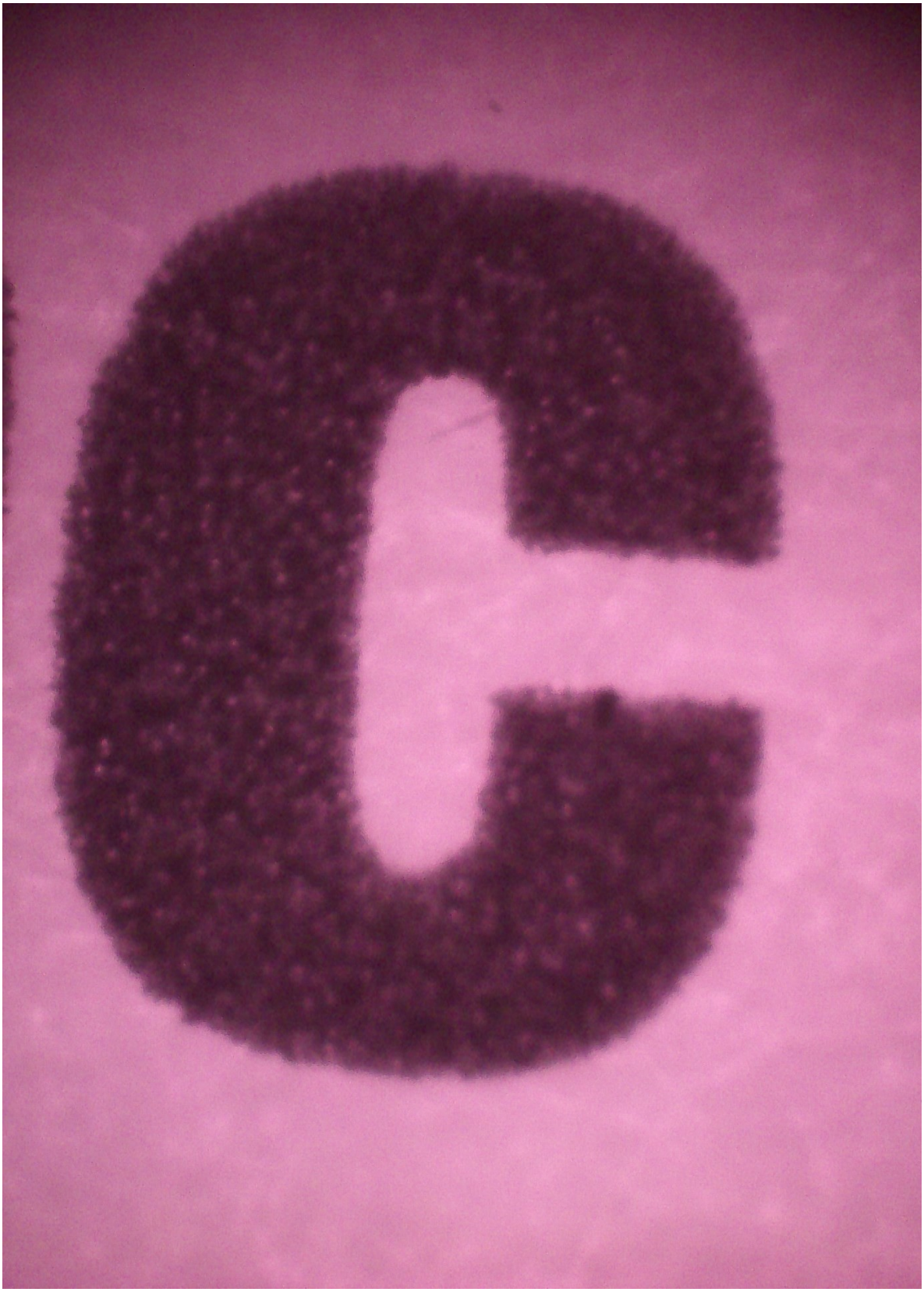


Part of a staple 4x

Part of an electronic component 4x



Part of a RGB LED 4x



A “C” written on a package 4x

CONCLUSION:

As it was shown above, it is possible to use the built in tungsten lamp of the microscope and a camera with the property of allowing the passage of NIR light. This expands the range of objects to see under the microscope because thick ones can be observed that cannot be seen in brightfield.

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