Lapped and Un-lapped Micro-Fine Stones at 800x

Posted by wickededge - 21 Aug 2012 15:14

This was a really fun study to do on the Wicked Edge knife sharpener - I started by sharpening a blade to a near perfect finish using kangaroo strops and .25 micron diamond spray. Here is the edge just after the strops:

There are a few small scratches but the bevel is very smooth overall.

Then I created a micro-bevel 5 degrees wider with a set of .6 micron Micro-Fine ceramic stones that I had not previously lapped. Here is the image:

It's easy to see the micro-bevel and the way the metal has been grooved.

Next I used a set of .6 micron ceramic stones that I had lapped to create another micro-bevel at 4 degrees lower, so just in between the stropped edge and the unlapped micro-bevel. Here is that picture:

You can see the smooth section where the blade had been stropped, then 1 degree wider there is a small band where the lapped .6 micron ceramic stones were used and then a wider band where the unlapped .6 micron ceramics stones were used. Clearly, lapping the stones will yield a more refined edge. I'll try another experiment soon where I use each stone on the very edge. I find the ridge of metal being pushed toward the stropped portion interesting. I was using edge leading strokes, pushing into the blade and clearly pushing metal back up the bevel toward the stropped area.

You can check out the zoomed images on my here on my **blog** .

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Re: Lapped and Un-lapped Micro-Fine Stones at 800x
Posted by wickededge - 22 Aug 2012 08:45

I've found that getting the nano-cloth slightly damp really helps, otherwise, the diamonds or CBN flies off in a powder.

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Re: Lapped and Un-lapped Micro-Fine Stones at 800x
Posted by mark76 - 22 Aug 2012 09:50

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wickededge wrote:

I've found that getting the nano-cloth slightly damp really helps, otherwise, the diamonds or CBN flies off in a powder.

I will definitely try. The problem with the nanocloth strops I have experienced is not that they don't work at all (they get slightly black-ish with metal filings), but that they work so little.

I think the whole point of the nanocloth is that it brings nothing to the party on its own.

Agreed. That's why I wondered how they compare to the kangaroo strops, which bring nothing to the party on their own either. (That may not be entirely true; they will probably burnish somewhat, but not abrade.)

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Re: Lapped and Un-lapped Micro-Fine Stones at 800x
Posted by ThomasMeeks - 22 Aug 2012 11:45

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wickededge wrote:

I lapped them with all stones 100#-1000# and the with a 3um bench stone I have though I doubt is was necessary to go that far.

Sorry, one of the noobs here joining in the discussion with noob qeustions...

Are you telling me that you took the 100 grit diamond stones and rubbed them together with the microfine ceramics (thereby abrading away ceramic material and roughening the surface) and then progressed up to the 1000 grit doing the same? This seems scary as $h1t to me! LOL I thought the benefit of the ceramics was their super smooth surface? Could you please elaborate on this process or even do a video of this?

Thanks!

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Re: Lapped and Un-lapped Micro-Fine Stones at 800x

Posted by wickededge - 22 Aug 2012 12:04

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Hey Tom,

It's pretty common to lap ceramic and waterstones to flatten them out and knock off the high points. I started with the 100# stones in order to efficiently flatten the ceramics and then progressed up through the grits to smooth the surface, ending with a 3 micron bench stone that yields a very smooth surface. I could take it a step further and use some sub-micron diamond spray on top of polished granite but it doesn't seem necessary - I'm really liking the results I'm getting.

ThomasMeeks wrote:

wickededge wrote:

I lapped them with all stones 100#-1000# and the with a 3um bench stone I have though I doubt is was necessary to go that far.

Sorry, one of the noobs here joining in the discussion with noob qeustions...

Are you telling me that you took the 100 grit diamond stones and rubbed them together with the microfine ceramics (thereby abrading away ceramic material and roughening the surface) and then progressed up to the 1000 grit doing the same? This seems scary as $h1t to me! LOL I thought the benefit of the ceramics was their super smooth surface? Could you please elaborate on this process or even do a video of this?

Thanks!

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Re: Lapped and Un-lapped Micro-Fine Stones at 800x

Posted by mark76 - 22 Aug 2012 15:36

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wickededge wrote:

I started with the 100# stones in order to efficiently flatten the ceramics and then progressed up through the grits to smooth the surface, ending with a 3 micron bench stone that yields a very smooth surface.

Clay, I suspect many of us can go to 1000 grit diamonds for lapping. Would it be of any use to lap the micro fine ceramics against other ceramic stones for further refinement? Or would this have hardly any effect, since the lapping material is exactly as hard as the stone you want to lap?

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Re: Lapped and Un-lapped Micro-Fine Stones at 800x

Posted by wickededge - 22 Aug 2012 15:41

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mark76 wrote:

wickededge wrote:

I started with the 100# stones in order to efficiently flatten the ceramics and then progressed up through the grits to smooth the surface, ending with a 3 micron bench stone that yields a very smooth surface.

Clay, I suspect many of us can go to 1000 grit diamonds for lapping. Would it be of any use to lap the micro fine ceramics against other ceramic stones for further refinement? Or would this have hardly any effect, since the lapping material is exactly as hard as the stone you want to lap?

I think the surface finish you'll get with the 1000# diamonds is probably more than sufficient. Rubbing the stones together afterward should work well to give a final smoothing to the surface.

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Re: Lapped and Un-lapped Micro-Fine Stones at 800x

Posted by AnthonyYan - 23 Aug 2012 01:34

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wickededge wrote:

I added a scale to the last image as requested earlier by Lagrangian:

Zoom

[EDIT (8/25/2012): Clay says he may have used the wrong length-scale for this image. See Clay's update post(s) and my follow-up after this post (in this thread) for the corrected image(s) and number(s).]

Thanks Clay! Very interesting.

By my measurements, that 100 micron line is 476 pixels wide and 186 pixels tall.

Using the Pythagorean Theorem, I get that the line is about 511 pixels long.

So there are about 5 pixels per micron.

The wavelength of visible light is 0.38 to 0.74 microns.

So the wavelength of light is around 2 to 4 pixels!

Sincerely,

--Lagrangian

P.S. Theoretically, the best possible resolution for an optical microscopes is around half a wavelength, which is approximately 0.2 microns. See Nikon's microscopy website for details.

www.microscopyu.com/articles/optics/index.html

P.P.S. Clay, if your camera can take pictures which are uncompressed (such as RAW, TIFF, or PNG), then I would be quite curious to examine one or two uncompressed images.

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Re: Lapped and Un-lapped Micro-Fine Stones at 800x

Posted by wickededge - 23 Aug 2012 10:41

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Lagrangian,

I think I did the last scale incorrectly. Here is another, uncompressed TIFF with the scale added using a much simpler and more accurate method: Uncompressed Image It's still been shrunken by Blogger. If you send me your email address, I can send you the full image via dropbox or something similar - it's over 28 MB in size.

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Re: Lapped and Un-lapped Micro-Fine Stones at 800x

Posted by AnthonyYan - 23 Aug 2012 12:24

Hi Clay,

Thanks! I sent you a private message with my e-mail.

Sincerely,

--Lagrangian

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Re: Lapped and Un-lapped Micro-Fine Stones at 800x

Posted by AnthonyYan - 25 Aug 2012 02:16

Hi Clay,

Thanks for the updated and uncompressed image.

I measured the 20 micron line to be 216 pixels long.

So a micron is about 10.8 pixels in length.

So the wavelengths of visible light (0.38 - 0.74 microns) would be 4 to 8 pixels.

The highest theoretical resolution for an optical microscope is about 1/2 wavelength, or 0.2 microns, which is around 2 pixels. Of course, most microscopes don't have such a high resolution in practice, but some get close.

Pretty neat!

Sincerely,

--Lagrangian

P.S. For the .jpg that Clay posted above, the 20 micron bar is about 97 pixels wide. So the pixel measurements are approximately one half the numbers above.

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