What grit/micron should I have mirror polish?

Posted by t76turbo - 16 Nov 2011 21:01

Here is my lineup of available paddles....

100/200, 400/600, 800/1000, 1200/1600 ceramics, 3.5/5 micron paste on leather strops, and 3.5/5 micron paste on balsa strops.

I also have 1 and .25 micron sprays but I need to get another leather strop set to use it on.

I have done a few knives since getting the WEPS. I have gotten some pretty good results edge wise. But I just can't get the perfect mirror. I always have some residual hazing no matter how long I stay at each step or how I vary the direction. If I had a better macro lense I would take a pic but I dont. Just suffice to say the mirror is impressive to most folks but I know I can do better.

So how low do I need to go to get a perfect mirror finish? Or do I need to maybe work longer at some of the later steps? I thought I did enough but maybe not.

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Re: What grit/micron should I have mirror polish?

Posted by AnthonyYan - 30 Jul 2012 22:10

The wavelength of visible light is between 0.38 and 0.74 microns.

en.wikipedia.org/wiki/Visible_light

Modern optical microscopes have a resolution limit of 0.2 microns (about 1/2 wavelength).

microscopyu.com/articles/optics/index.html

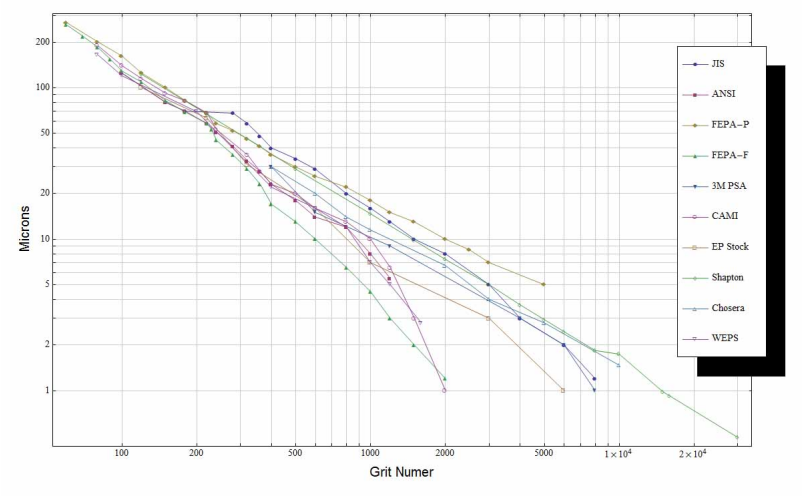
Telescope mirrors are accurate from about 1/8th to 1/20th wavelength, with the most common being around 1/10th wavelength. Although, they are often smoother than this.

So if you can get your scratches significantly below 0.2 microns then you should have a very good mirror finish. So my guess is if you can get scratches down to around 0.1 to 0.05 microns, it'll be a superb mirror finish even under a microscope.

It is interesting to think about the above in relation to the size of abrasive particles. Although I have no idea how to go from particle-size to scratch-size (it's too complicated; depends on hardness, shape, friability, pressure, binder, etc.).

Komitadjie's Grand Unified Grit Chart as plotted by Mr. Wizard:

www.knifeforums.com/forums/showtopic.php?tid/904090/tp/7/



Sincerely,

--Lagrangian

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Re: What grit/micron should I have mirror polish?

Posted by PhilipPasteur - 30 Jul 2012 23:40

Anthony,

Godd stuff.. in theory. Unfortunately you do not take into account the intrinsic reflectivity maximums for a given material. I will send some info tomorrow form one of the premier polishing companies in the world claiming a max of 65% reflectivity for "stainless steel". Of course different limits for different formulations of steel.

In any case, folks using 1000 grit diamonds will not see a mirror finish. People percieving a "mirror" at the 1200/1600 grit level, have a reflective surface, but a ways to go to get to the reflectivity limits of steel. My post was because I was trying to explore how some people say they have a mirror at X grit and others at XXX grit, and what accounts for the difference.

According to Tom and he has photomicrographs at 400x, the 0.17 micron grit of the 10K chosera is where he saw significant reflectivity ... at 400X that is as good as the empirical data that I have seen goes.

I will be intersted to see what can be done with Clays new microscope. I would love to see some sort of hard data that sorts one person's mirror from another's more highly polished mirror.

This is real interesting stuff.. as soon as we figure out that we can polish metal to the degree that we can rival optical mirrors... I can throw away a bunch of pyrex mirrors ground to 1/20 wave and optically coated for 96 to 98% reflectivity...

(of course then you have to deal with coefficients of expansion and other obtuse issues. They did give up on speculum polished metal mirros a hundred years ago...

Of course, then we need to figure out who cares about reflectivity of an edge... sharp is what we want.. polish is just pretty...

Phil

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Re: What grit/micron should I have mirror polish?
Posted by wickededge - 31 Jul 2012 08:26

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This is the best I've been able to do so far and I've been able to repeat it several times: Polished Edge I haven't had a chance to do it again and put it under the new scope (plus I'm still waiting for the 100x objective to come back from the manufacturer) but I'm pretty excited to check it out once I get back from VT.

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Re: What grit/micron should I have mirror polish?
Posted by wickededge - 31 Jul 2012 10:26

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I was able to do some measurements at 800x of a knife I sharpened up to the 10k Chosera stones.

Check here for the full sized image: 10K Chosera - 800x

For some reason, the measurements are really hard to read there, but they range from .89um to 1.51um. I only measured the major scratches. I'll keep working on how to post the images so that the measurements are easy to read.

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Re: What grit/micron should I have mirror polish?

Posted by cbwx34 - 31 Jul 2012 10:33

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RonRobichaux wrote:

I just purchased the WES a few weeks ago and have the same problem with getting a mirror look.

The smallest grit stones I have are the 800/1000 then the 5 and 3.5 strops.

How do you know when to go to the next highest grit. because my edge is not even close to mirror.

now it is sharp but dull and scratchy looking. I spent 30mins working on this.

Should the 1000 grit leave a smooth not polished finished...???

Is there a step by step instruction

on going from one grit to another?

[attachment:3]spdy blade.jpg[/attachment]

To add a bit to this... I sharpened a knife and repeated what you have... 1000 --> 5m --> 3.5m leather, and couldn't get a mirror finish, even with quite a bit of time on the leather. So, probably not possible, at least not in a reasonable time. (Forgot to snap a photo).

I then went back to the 1000 and then went to the new MicroFine ceramic... coarse then fine for about 50 passes with each. (I haven't lapped my stones). Then on to the 5m --> 3.5m leather for about 75 passes each, and got the start of a mirror finish (obviously without magnification)...

Still a bit of scratching, but considering how little time I spent, this would be at least a good start toward a finer/mirror finish, if that's what you're looking for.

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Re: What grit/micron should I have mirror polish?

Posted by PhilipPasteur - 04 Aug 2012 21:13

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I suppose that I am beating a real dead horse here, but

Shouldn't we have some kind of definition of "mirror edge"

before we try tell people how to get one?

I just finished a Ken Onion Foresite, suposedly an initial production blade in (depending where you read) Acuto 440 or Acuto +.

I went through the diamonds form 100 grit. I reprofiled to 18 degrees, just to see how this steel would do.

After the 1000 diamonds the blade was plenty sharp, but pretty much a matte finish.

I sued the Chosera 800 grit for 100 strokes, still matte finish. I went to the 1000 grit Chosera stones for 100 strokes. Now I was getting something that was pretty reflective, but still not what I call a mirror edge.

I progressed through the 2K and 3K Chosera stones, now I could see detail in the reflection form the blade. At this point I would call it real darn shiny, but not a mirror. I think at this point well taken photos on a macro level would show clear text reflected.

I went to the 5K Chosera stones for 150 strokes. Now it was real shiny. Good enough given the angle of the reflection to make real impressive pictures with text reflecting off of the edge. Still if a light was

shined pretty close to along the edge and the eye close to parallel to the blade, there was a bit of fog.

I went to the 10K choseras fro 150 strokes. Now we are getting close to a mirror. It is gleaming with incident light, but at at angle close to 180 degrees, still a bit foggy.

I went to a Naniwa 12K Superstone for 150 strokes. Now it is getting close to your bathroom mirror. The overhead light quite detailed in the edge, without picking the best angle.

I have a 15K Shapton set still to try, but I skipped that and went to strops with 6 micron, 3 micron (DMT paste) and then 1 micron and 0.5 micron diamond on leather. I don't think that this changed the reflectivity much at all. I only did 100 strokes per grit. Just enough to refine the edge a bit and give a bit of convex grind to it. The knife is really scary sharp and glitters like freshly polished chrome.

So what is a mirror edge? Obviously to me, that is relative to the observer, the kind of steel and how much the edge is polished. The constant in the conversation is, finer grits make for a more polished/reflective edge. The more reflective the edge is, the more mirror like it is.

If you aren't getting what you consider to be a mirror edge, use finer grits !!

As a direct answer to the OP, for my definition of a mirror edge, you need to get to the 5K Chosera level (or Shaptons, but according to Tom, who loves the Shaptons, they don't polish as well). That is about 2.8 microns (2.94 for the Shaptons). You can definitely get there with pastes or 3M lapping films at the similar grit levels, but it will take much longer. There is just not as much abrasive involved in the pastes, sprays or films as the better stones.

Phil

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