



Happiness is a Smooth Bottom

The Search for Smooth

For many glass artists, the elusive smooth bottom has been the goal that always eludes our best efforts. I'm not talking about the kind of smooth bottom a baby has but the kind you wish your glass had after it was fired.

It is possible to get the bottom surface of a fused project as smooth as the top surface. Cold finishing will smooth off even the roughest surface but there are a few things you can do to improve how smooth the underside of a fused project is with extensive coldworking. The secret to a smooth underside is to create a smooth surface to fire the glass onto. The same principle "precaution prevents treatment" that applies to health care applies equally to finishing glass. Often, it's better, and easier, to prevent the problem than it is to correct it.

Start With a Smooth Surface

The greatest difference in texture comes from how smooth the shelf or mold is you use to fire onto. Stainless steel molds are smoother than ceramic molds so will produce a smoother surface. Different materials used for kiln shelves will produce varying degrees of smoothness depending on how porous the material. You can fire flat on flat pieces of stainless steel to get a smoother underside but if you use other than relatively small pieces, you risk the possibility the sheet steel will warp during firing. Just as glass softens when heated, so does metal. Even very thick pieces of steel can, and will, warp when heated. I've learned that a terrific material to use to provide a near perfectly smooth shelf to produce a super smooth finish is clear float glass. It won't warp and, being harder than the glass used for fusing, won't soften until much higher temperatures - about 50F higher.

Kiln Wash

Spraying kiln wash on does not necessarily produce a smoother finish than brushing. Some things you can do to get a smoother finish with brushed on kiln wash are:

- Select a fine grain kiln wash. Not all brands are of equally fine grain.
- Apply with a sponge or a fine bristle hair brush. With proper sanding, this will produce a surface as smooth as spraying and is much less messy with much less work.
- Use thin kiln wash. Mix 6 parts water to 1 part kiln wash. More thin coats will always produce a smoother surface than fewer thick coats.
- Allow each coat to thoroughly dry between coats. Placing your mold or kiln shelf on a kiln while it's firing will speed up drying.
- Gently sand the finished shelf when dry. Your finger tips or a dry sponge work exceptionally well to smooth sand kiln wash.
- Sponge wipe the final coat. Soak a sponge in warm water, squeeze out as much water as you can, and gently wipe the surface with the damp sponge.



Kiln shelf drying on warm kiln



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Applying kiln wash onto steel mold on warm kiln



Smoothing kiln wash with damp sponge

Kiln Paper



Sanding kiln wash with finger tips

Kiln paper is convenient but should not be assumed to leave a smoother underside than kiln wash unless you're doing a lousy job applying your kiln wash. Kiln paper will produce a uniform texture but it will always leave a slight orange peel like texture. My personal choice is to use kiln paper only when I have concerns about air being trapped between the glass and the kiln shelf. Kiln paper helps allow air to escape. It is possible to get a second firing with kiln paper if you carefully remove the glass without disturbing the powder left after the firing. A small suction cup is a great tool to allow you to lift the glass off without disturbing the powder. Not all kiln paper is the same. Some brands turn to powder that must be vacuumed out while other brands remain intact and can be lifted out with a spatula. Some brands can only be used once while others can be fired on multiple times.

Boron Nitride on Stainless Steel

Sprayed on boron nitride is a quick convenient way to produce a smooth finish. To get kiln wash to stick to steel molds, it's necessary to sandblast or scratch coat the steel to provide "tooth" for the kiln wash to stick. Not so with boron nitride. It applies



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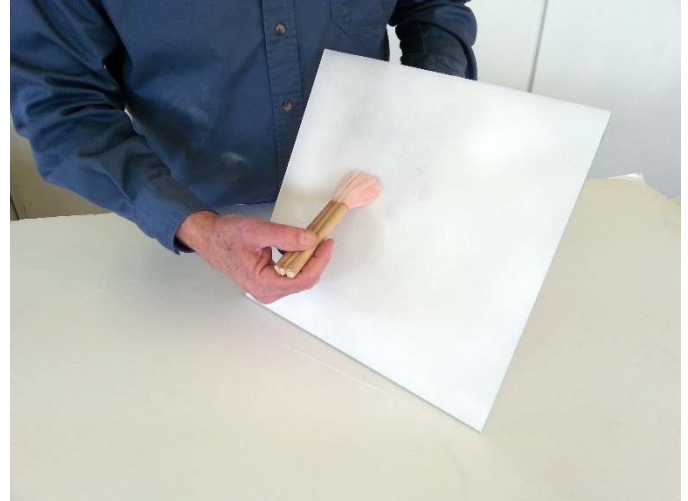
best if sprayed onto clean smooth metal. Here's how to use boron nitride on steel:

- Carefully clean the metal.
- Spray a light smooth uniform coat and let dry.
- Repeat with a second coat to ensure full even coverage.
- Hold the spray can a uniform distance away while spraying – about 8 inch (20 cm).
- Spray straight on and in smooth slow even movement.
- Handle carefully to avoid smearing the sprayed on material.

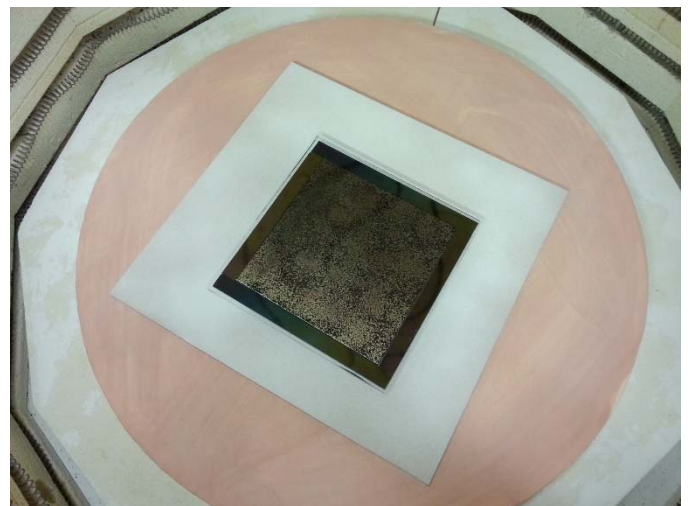
Boron Nitride on Ceramic Molds or Kiln Shelves

This can produce an exceptionally smooth surface on the glass. If you do any kiln casting in ceramic molds, a terrific bonus with boron nitride is, being much smoother than kiln wash, the glass slides into the mold smoother and leaves a lot less spears and spikes along the edge. Apply the same as on stainless steel but take great care to be sure you have completely removed any kiln wash previously applied. If you want to apply boron nitride on molds or shelves that have previously been coated with kiln wash, take extraordinary care to ensure all kiln wash has been removed before applying the boron nitride. Repeat – COMPLETELY REMOVE ALL KILN WASH.

There will be a small amount of loose material left on the surface of boron nitride after it is sprayed on. Gently brushing it off with a soft brush will remove the loose material and create a smoother surface.



Brushing off boron nitride sprayed onto glass shelf



Firing a fused project onto a BN coated glass shelf

Refiring

It's always tempting to refire on kiln wash or boron nitride but it's a temptation that should only be yielded to with great caution and restriction. Neither kiln wash nor boron nitride is intended for multiple firings above drape/slump temperature. Multiple use increases the likelihood the glass will stick to the



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mold. How many times you can reuse depends entirely on the temperature you fired to. A guideline I use that has proven safe and successful is:

- Slump/drape temperature – unlimited reuse.
- Tack fuse temperature – reuse once then recoat.
- Full fuse temperature – never reuse. Recoat after every use.

Float Glass Kiln Shelf

Yes, you can use clear float glass as a kiln shelf. It's harder than the COE 90 or 96 glass used for fusing so won't soften until higher temperature. About 50F higher. I experimented using pieces of clear glass coated with boron nitride. The result was a smooth bottom. How smooth? Well as smooth as glass. At tack fuse or full fuse temperature, there will be a very slight indentation in the float glass. No problem. Flip it over and use the other side next time. Float glass is cheap.

Degree of indentation in float glass:

1200F (650C)	<i>undetectable</i>
1250F (675C)	<i>undetectable</i>
1300F (705C)	<i>undetectable</i>
1350F (730C)	<i>undetectable</i>
1400F (760F)	<i>about .5 mm</i>
1450F (790C)	<i>about 1 mm</i>
1500F (815C)	<i>about 1.5 mm</i>

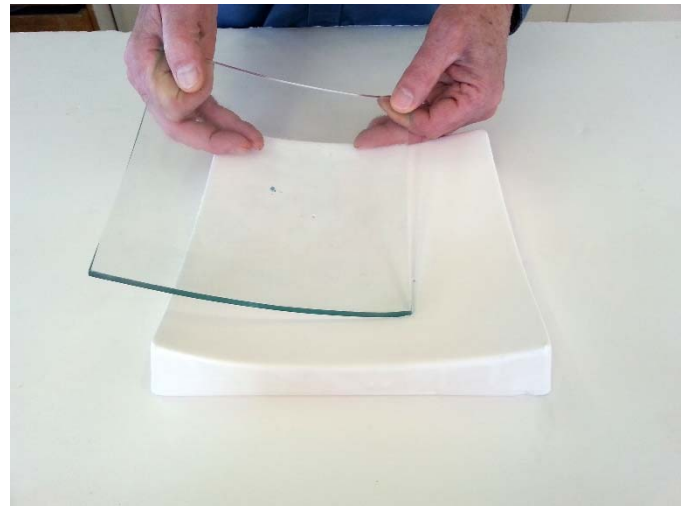
Because boron nitride is much smoother than any kiln wash, glass sliding along it has less friction than glass sliding along kiln wash. This ensures there are none of the edge spikes so common in glass fusing and castings.

If you are fortunate enough to get some sheet borosilicate glass, it's lower COE 33 makes it much harder than float glass COE 82 so it will not be affected at all by even a full fuse temperature firing and can be reused repeatedly.

Float Glass Molds

You can make a float glass mold by slumping float glass over one of your ceramic molds or over any found object that will tolerate the temperature of firing in the kiln.

Because the float glass mold will flatten when you use it to slump into, it must be fired set inside something to hold its shape. When using a float glass mold, take care to adjust your firing schedule to include the thickness of the float glass mold along with the thickness of your project. For example, a 1/4" (6mm) thick project fired onto a 1/4" (6mm) thick float glass molds requires a firing schedule ramp speed for 1/2" (12mm) thick glass.

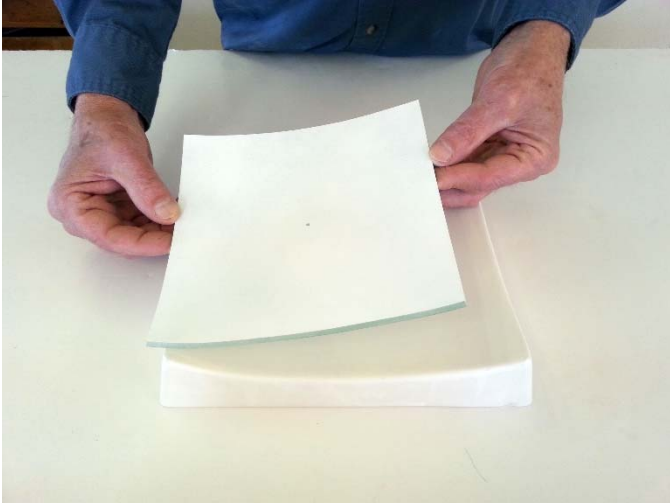


Float glass molds made from ceramic mold



Glass Campus

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BN coated float glass mold ready to fire

Float glass molds will produce a smoother finish on the bottom of a slumped project than ceramic molds but must be placed in the mold they were originally slumped in when used in the kiln. If not, they'll just flatten out when fired.

I'm still experimenting trying to get the smoothest possible bottoms (everybody needs a goal in life). I haven't yet been able to be my glass bottom as smooth as a baby's bottom, but I'm working on it. I wonder how talcum powder would work as shelf primer?