PROJECTS DIY WELDING ROD

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Prepare for the zombie apocalypse by rolling your own.

Written by **Chris Hackett**

There are a bunch of DIY welder articles and how-tos out in the ether, ranging from the super simple, dumb, and brutally effective (3 car batteries wired in series) to the high-tech and fancy (TIG machines from microwave bits, oxyhydrogen torches from split water and plumbing supplies).

It's safe to say that experienced makers will be fusing metal even if an exceptionally biblical catastrophe were to strike the welding industry. If civilization and supply chains collapse, the anti-zombie fences will still get built, and the Thunderdome will be sturdy and made from steel.

However, all the DIY welders I've seen assume that you have access to welding rod. For the less weld-informed, a good, solid weld involves more than melting and fusing metals — the weld zone needs to be free of oxygen, otherwise the normal oxidation of metals that leads to rust, patinas, and discoloration happens at a dizzyingly rapid rate, accelerated by the high heat. This is not just an aesthetic issue — the oxidation happens inside the weld, so instead of a solid metal bond, you get a brittle foam filling.

Rod Research

» My first step was to look up patents, which lay out the crucial core of a technology. Often, the making process is laid out as well, protecting the inventor's rights to the means, as well as the ends. This keeps patent attorneys employed, and provides a nice step-bystep for writers to rip off.

» I dug up the patent "Electrode for Arc Welding," filed in 1918 by Reuben Stanley Smith, a prolific inventor and resident of Milwaukee, Wis. Basically, a steel rod is wrapped in cellulose (paper) soaked in sodium silicate, and the wrapping is crimped to maintain close contact with the rod. The electrodes are then dried out.

» The rod is the electrode and filler; the paper/sodium silicate wrapper spews out shielding gas upon combustion and provides a path of plasma to guide the arc. The rod does not deposit a protective ceramic slag like modern welding rods, but, as Mr. Smith stated in the patent, "I have found, also, that the coating of slag produced by the use of known covered electrodes is not essential to the production of eminently satisfactory work." I tweaked the patent procedure a little to use commonly available materials.





MATERIALS

- » Silica gel packets (2–3) usually labeled "Desiccant: Do Not Eat" and packaged with electronics, shoes, and other things that hate dampness
- » Lye, 100% sold as drain cleaner
- » Steel wire or coat hanger, 2' or more to cut into welding rods
- » Newspaper » Plastic cups (3)
- » Nitrile or latex gloves
- » Stir sticks, plastic or wooden

TOOLS

- » Digital pocket scale
- » Hot plate to cook the lye and silica gel into sodium silicate » Pliers
- » Safety glasses or goggles
- » Cooking vessel, tempered
- glass or nonreactive ceramic don't use metal or Bad Things might happen
- **» Toaster oven** to cook the rods. A rod oven, or some time in the sun, should do the trick as well.
- » Mortar and pestle, or scrap of metal round stock

CAUTION Wear gloves and goggles, and weigh out the parts individually. A little lye in the eye or in a cut on your hand will ruin your day.

Removing the oxygen is usually achieved by flooding the weld area with inert gas — regulated, pressurized gas from a separate tank in the case of MIG and TIG welding, or gas created from vaporizing flux in oxy-fuel, stick, and flux-core welding. The standard, flux-coated arc-welding rod is the common currency of welding, used to hold the world together. You can get them everywhere. Until you can't.

Even the finest DIY welder is useless without welding rod. I did a bunch of research, and as far as I can tell no one has made their own welding rod and documented it online. A minor but potentially crucial gap in the DIY world, solved here (and on the web at makeprojects. com/project/d/1712).

1. Make the sodium silicate.

If you have some lying around, you can skip this step. Empty out the silica gel packs until you have a pile of beads about the size of a large walnut.

Get smashy with the silica gel beads. A mortar and pestle work best here. I didn't have one, so I rolled the silica gel package with a metal rod (**Figure A**).

Time for some chemistry. Zero your scale. Sodium silicate is made from water, silica gel, and sodium hydroxide (lye). The proportions (by weight) are 6 parts silica gel (crushed as best you can), 4–8 parts lye (4 will work, 8 is stoichiometric, and anywhere in between is fine), and 10 parts water (**Figure B**).

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Heat the water, then slowly add the lye while stirring (**Figure C**). If you just dump the lye in, you'll get a solid, hard lump of a caustic base at the bottom of your heating vessel. The only way I found to remove it was neutralizing it with some decently strong hydrochloric acid. It totally looked like Science, but was an annoying waste of time.

Heat and stir until you get a clear but ominously thick solution. Be wary, but not too afraid — it can smell your fear.

This next part can be tricky — add the silica gel powder to the lye/water solution, but just a little bit at a time. Take the solution off the heat when you add the powder, then return it to the heat while you stir. If you leave it on the heat for too long it will boil over in an instant. If it gets too cool the silica gel won't go into solution, and will clump at the bottom.

Done right, the result will be a gummy gel, sodium silicate (**Figure D**)!

2. Prepare the rods.

Straighten the coat hanger, then cut pieces of welding-rod size: about 1' long will work.

Hangers are usually covered with paint or clear varnish, likely to avoid leaving your clothing stained with rust (I've never used a hanger for the intended purpose). Sand away the varnish or paint until you're left with a shiny rod of steel (**Figures E and F**).

Cut paper strips a little shorter than your rod. Each strip should be wide enough for 8–10 wraps around the steel (**Figure G**).

Paint a layer of sodium silicate onto the paper (**Figure H**). You want the paper to be as saturated as possible. I found that painting both sides allowed the sodium silicate to soak in nicely and evenly.

Roll the saturated paper around the steel rod; again, 8–10 layers will do. Try to get it as consistently tight as possible. It's harder than you'd think. Smooth the layers as you go, and smoosh the trailing edge into the rest of the



wrap (Figures I, J, and K).

Use pliers to crimp the gooey paper tightly and uniformly onto the rod to prevent the coating from disintegrating faster on one side than another.

3. Bake the rods.

Cook the rods in a toaster oven at a low heat for about 15 minutes. This drives out moisture, and also makes a carbonized shell that keeps the rods intact when stored. You want them to be totally dry and golden (**Figures L and M**).

4. Weld.

You're ready to test. I guess for maximum punk-rock DIY points I should have tested them using a car-battery welder, but the arc welder was right there.

I used the recommended settings for a ³/₃₂" rod: DCEP, around 100 amps (**Figure N**). Striking an arc took a couple of tries, but once I figured out the correct distance and angle,

the rod burned almost as well as an off-theshelf rod (**Figure O**). Tons of smoke, though, and the arc was not super stable.

Then I welded with the homemade electrode (**Figure P**). It was splattery and ugly (you can partially blame user error and a bit of a learning curve), but it definitely looks like a weld (**Figure Q**). Notice the lack of ceramic slag — just some ash.

I then brushed it to see the glory of my weld. Looks OK, in parts. The weld side is not pretty, but the backside shows good penetration (**Figures R and S**).

I chopped the weld up for a closer look, and success! No pitting, no craters, and total fusion of the metal (**Figure T**). Welding, from home-rigged rods. Take that, zombies.

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