

But What About Ammo Volume 2

How to cast and electroplate your own 9mm bullets
By Cathode
Version 0.98

Preface

But what about ammo is a project that explores DIY ammo manufacture under conditions where ammo is regulated, hard to obtain, or solely for hobby interest.

Special Thanks to IvanTheTroll, who wrote volume1 and has brought countless people knowledge on how to build their own firearms.

This is the second volume on how to cast and electroplate ammo. It focuses on casting your own bullet using lead and plating them with copper using easily obtainable materials. This guide is handy in the following situations, or merely for those wishing to make their own bullets.

0. In areas where governments regulate the sales of bullets.
1. bullets become hard to obtain in an apocalyptic scenario.
2. you wish to reduce the expenses on reloading your ammunition at the cost of a few extra steps.

This guide will provide step by step instruction on melting lead, casting lead bullets, and building your own electroplating machine for plating the lead bullets with copper. Powder coating instructions will be also provided here. Although cast lead bullet can be used for reloading immediately, it requires special lubricants, and the lead residue will gunk up your barrel after just a few shots and drastically reduce your gun's accuracy.

Additionally, I will also provide information and instructions for making your own 9mm bullet molds. This is in case the sales of bullet molds are restricted, or you wish to design and cast customized bullets.

A personal note from Cathode:

Reloading is not something that comes without risk. Improper bullet quality or incorrect amount of propellant can cause catastrophic explosive firearm failures, which may result in serious injury or death. Firearms and ammunition require being treated with caution and respect, and it is yours responsibly. This includes custom cast bullets.

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Shopping list:

Tools required for casting bullets:

A pair of pliers.
1 Empty soup can or crucible.
A stove or something that can get hotter than 300°C.
Tongs and screwdrivers.

Tools required for making your own electroplating machine:

A 3D printer with build volume >=200mmx200mmx200mm + filament of your choice, PETG recommended.
A bench power supply (PSU).
Soldering Iron.
Electrical wires and clips.
Sand paper.
Vinegar or citric acid.
Flex seal (optional).

Tools recommended to have in hand:

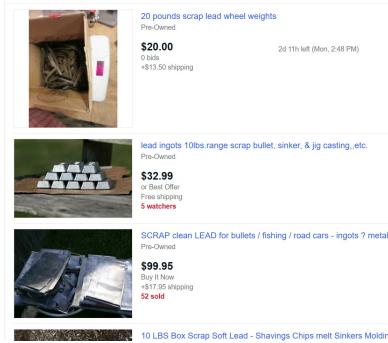
A turret or single stage reloading press.
9mm Bullet sizing die.
An IR thermometer.

Materials for casting your own 9mm bullets:

LEE mold 9mm 124-grain bullet - Easily obtainable and can be acquired in many European countries. I bought mine off eBay. Note: some molds require you to purchase the handles separately.



Lead ingot/scrap - Any source of lead is fine. The lead will be melted down and poured into the mold to make bullets.



Materials required for making your own electroplating machine:

A Greartisan 10 rpm DC brushed geared motor. 5 rpm is good as well.

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Greartisan DC 12V 10RPM Gear Motor High Torque | Speed Reduction Geared Motor Centric Output Shaft

★★★★★ 120

\$13.99

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★★★★★ 116

\$17.94

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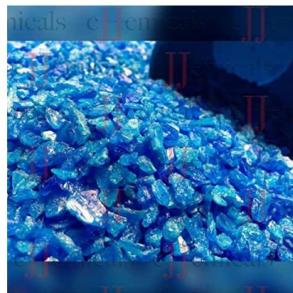
Copper II Sulfate. These are commonly sold as root killers and are not regulated. Handle with gloves and avoid eye and mouth contact; for further precautions, consult the MDS sheet.

Price and other details may vary based on size and color



Sanco Industries Root Destroyer - 2 Pounds (32 Ounces) - Copper Sulfate Pentahydrate

★★★★★ 694



Copper Sulfate Crystals 99.8% Minimum Purity! 10 pounds

★★★★★ 70

£7.50



Roebic Laboratories K-77 Root Killer, 32OZ

★★★★★ 728

£20.77

FOAMII Roots ii Contair Jug)

Muriatic (Hydrochloric) acid. This is usually sold as a cleaning agent or pool acidifier. If you are unable to find HCl, diluted sulfuric acid (battery acid) can be used. Be extremely cautious. Acids can cause permanent injuries or death if misused. HCl is corrosive and poisonous. Handle with gloves and avoid eye and mouth contact; for further precautions, consult the MDS sheet.



Dish soap.

Tools required for powder coating your bullets:

A toaster oven with a tray that can reach 200 °C.

A Plastic container with a lid, recycle number should be 5.

A soup spoon with holes.

Materials required for powder coating your bullets:

Harbor freight powder coat paint. (Pick your favorite color.)



16 Oz. Powder Coat P

(71) Write a R

Create a nearly indestructible finish

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EXTRA- Tools required making your own silicone bullet mold:

Chopsticks.

A container.

A gram scale.

EXTRA- Materials required for making your own silicone bullet mold:

Mold Max 60 High temperature silicone.

Mold Max 60 High Heat Resistant Silicone Mold Rubber - Trial Unit
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Price: \$25.61 + \$9.89 shipping

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Once you have everything collected and ready, you will be able to make your own 9mm bullets following the instructions below.

Part 1: Melting and Casting bullets using lead

This part is very straight forward. Lead melts around 300°C so you can use a barbecue grill or a stove. Don't inhale the lead fumes.

You can use a soup can as your crucible, or you can buy a dedicated crucible off the internet. Place your lead into the crucible and place it on the heat source of your choice. Here is my setup:



Once the lead melts, you can get your LEE mold ready.



Use a pair of pliers to pick up the crucible and carefully pour molten lead into the mold.



Wait for about 30s for the lead to solidify, then shear off the extra lead using the outermost handle of the mold. The additional lead sheared off can be put back into the crucible.



You can then pull apart the 2 main handles and collect your newly formed lead bullets.



Once you have a sufficient number of bullets cast, you are now ready to electroplate or powder coat your lead bullets.

Part 2: The electroplating machine

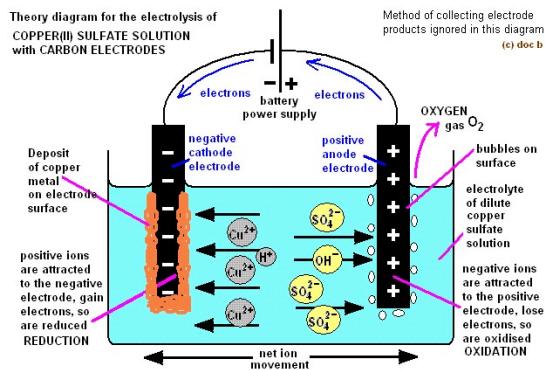
You'll need an electroplating machine to plate your lead bullets with a shiny copper coating that looks amazing and protects your barrel from leading up. Print all of the stl files provided with your 3d printer. If you want to you can flex seal the square tank.



You will need a copper donor as the Anode. The easiest way to do this is to coil up a piece of bare copper wire and place it on the bottom of the tank. It can be a piece of copper sheet or pipe. The shape doesn't really matter as long as it is pure copper, and it doesn't interfere with the drum. The Anode is sacrificial and will become smaller and smaller. It is advised to keep extra anodes as replacements.

Here is how this setup works in a brief concept:

During plating, the anode copper is being oxidized, moved into the electrolytes as ions, and ultimately reduced back to metal at the cathode, all driven by the voltage applied.



Anode is placed into the tank.



The motor and drum can then be inserted.



A cathode is required. You can simply solder a bullet onto a wire that's long enough.



Next, you need to prepare the electrolyte.

Use hot water to dissolve the Copper II Sulfate until it is saturated. Next, dilute the saturated solution with water of the same volume. This process brings the saturation down to 50% and prevents copper powder crashing out around the anode. Add 1mL of dish soap per 1L of electrolyte. The dish soap is a surfactant and will improve the plating smoothness. Fill up the tank. The solution should be a brilliant, rich blue color.

Before plating, bullets must be treated so the copper will stick. Copper will not adhere to shiny, smooth surfaces. You need to soak the bullets in muriatic acid for a few hours to activate their surfaces. Be careful, lead is toxic if inhaled or ingested, and muriatic acid is corrosive and poisonous. Wash your hands after you are done, and gather all the lead powder and lead contaminated acid to be disposed of by recycling facilities. Lead is bad for the environment. Wearing gloves and respirators is highly recommended and encouraged.



Put the roughened lead bullets into the drum, and connect the motor to a power supply. Dangle the Cathode into the drum, and make sure the Cathode makes contact with the bullets. My recommended motor speed is 5rpm-ish.

To prevent oxidation, keep all bullets submerged in the electrolyte.



Be careful not to overfill the drum. Bullets should not fly out or make the drum hard to rotate. Connect the Anode (copper donor) to the positive terminal of your PSU, and connect the Cathode

(the dangling wire) to the negative terminal of the power supply unit.

Set your voltage to 1.5-3 volt and wait for 3-5 hours. The longer you leave the setup running, the thicker the plate will be. The copper-plated bullets should look like this:



Rinse the bullets with water and dry them with a towel. They won't look shiny, which is perfectly fine. Hand polish them or tumble polish them as you need for better aesthetics. Size your bullets if you are able to obtain a bullet sizing die for better bullet dimensional accuracy and consistency.



Next, you will need to Test the bullets by forcing one down a barrel manually.



If the bullet engages the rifling well and does not shed copper, you've done an excellent job. You can load them into 9mm cartridges now. Follow the instructions provided by Ivan in BWA volume I to reload cartridges. I recommend you weigh the bullets first and find the average weight of the batch. It will be helpful for you to determine the amount of propellant for reloading.



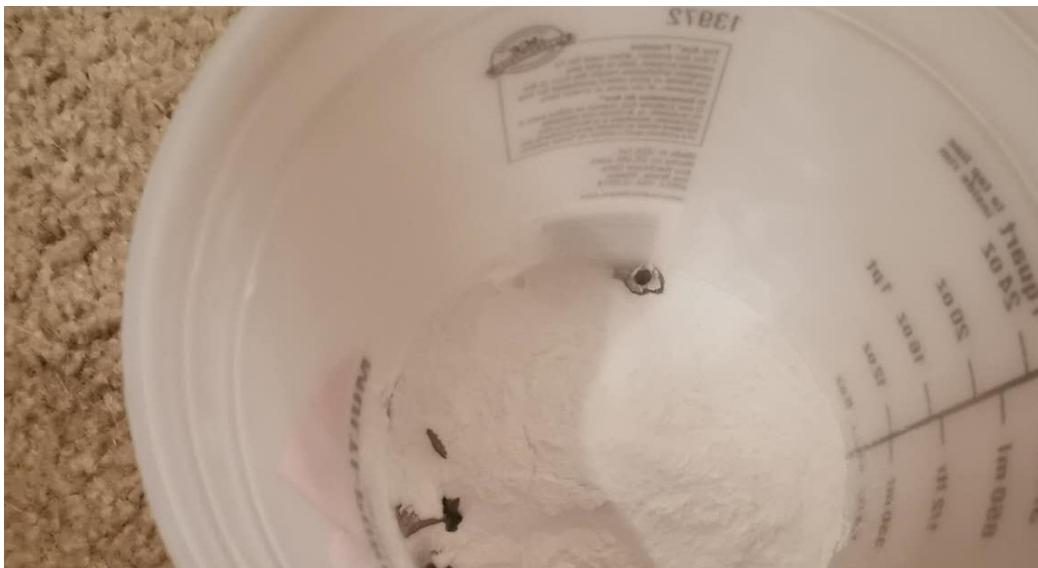
Part 3: Powder coating your bullets as an alternative to electroplating

Powder coating is another way to finish your cast bullets. Powder coating will give your bullets flexible, durable polymer jackets and prevent lead build up in your barrel.

Fill your plastic container with the powder coating paint and cast bullets. Be careful not to overfill the container, and the bullets should be fully submerged in the powder.



Close the lid and shake the container vigorously for at least 2 minuets.



Your bullets should pick up an even layer of powder now. Carefully remove the bullets using a soup spoon with holes and place them on the toaster oven tray.



Set the oven to 200°C and let it bake for 20 minutes. I picked this oven up for free near a recycling bin. Don't use your oven to cook food again once it has been used for powder coating.



Let the polymer coated bullets to cool down. If you are satisfied, you can now size them using the 9mm sizing die and use them for reloading.

If the coating is too thin, throw them back in the container, shake them and bake them again to build up a second layer.

Test the bullets by forcing one down a barrel manually. If the bullet engages the rifling well and does not shed plastic, you've done an excellent job. Your bullets are now ready to be used for reloading.



Extra: Making your own bullet mold using high temp silicone

Print the bullet mold .stl file using 0.12mm layer definition. Use a lighter to swiftly burn away the stringing plastic.



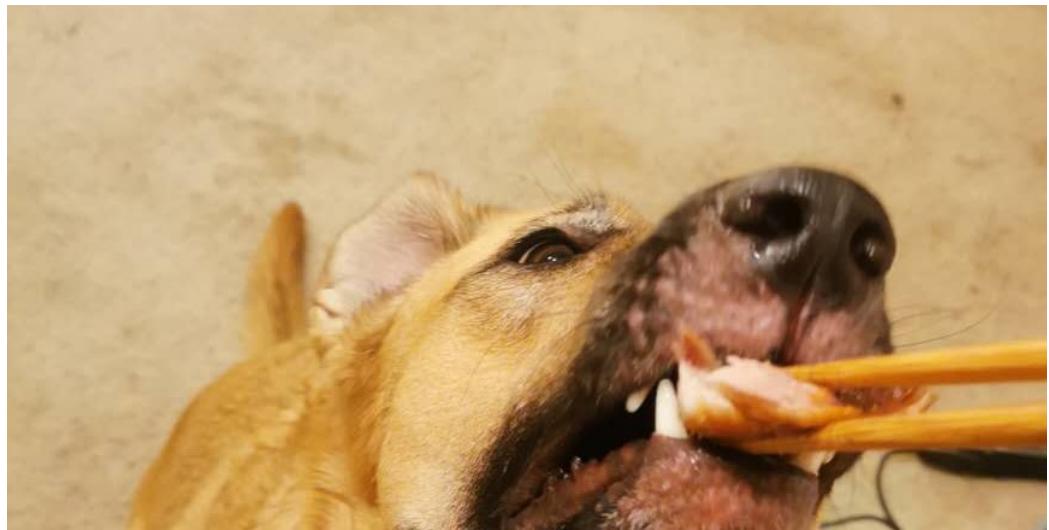
Mix the silicone in a container with a pair of chopsticks. The silicone and curing agent should have a weight ratio of 100:3. Pour the well-mixed silicone into the 3d printed bullet mold slowly and steadily to avoid bubble formations. If you have hollow-point bullets, dab a little bit of silicone with your chopsticks to fill up the tip of the hollow point first to avoid bubble build up.



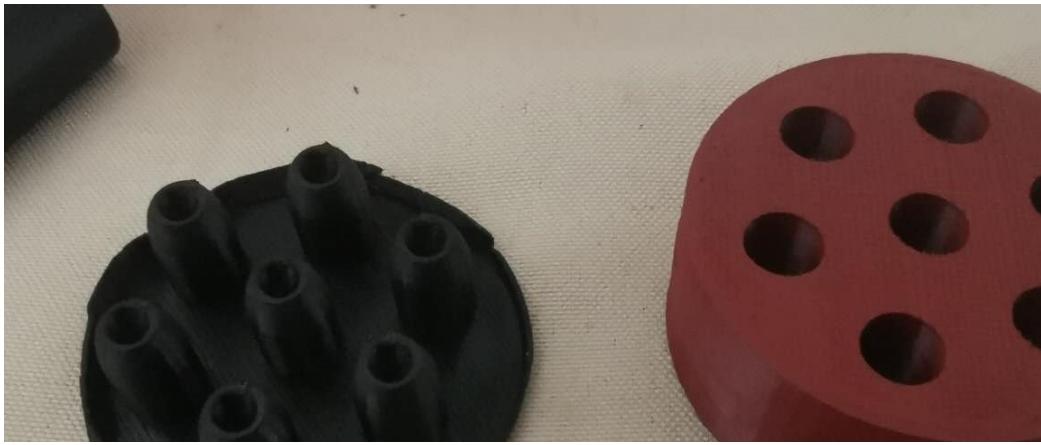
Next, flick the mold for about a minute to assist the bubbles escaping. Bubbles trapped will cause defective casts.



Wait patiently for the silicone to cure. Place the mold on a level surface, and don't disturb it for 24 hours. Pet your dog, watch a movie, clean your guns, or something.



Remove the silicone from the plastic when the waiting is over. Break the outer walls of the print to make mold removal easier.



After inspecting your newly made silicone mold, you can then melt some lead and pour it into the mold like in part 1. **However, the silicone cannot withstand anything hotter than 300C, which is about the melting point of lead. You have to control your pour temperature very carefully or you will damage the silicone.** A thermometer is recommended.



Unlike the metallic LEE mold, the silicone does an absolutely terrible job dissipating heat. Leave your silicone mold to cool down for a few minutes before you remove the freshly cast bullets. The mold is ready to be used again. I have used the silicone mold over 15 pours, and the mold has experienced no visible damage, and the bullet dimension remains consistent.



After the bullets cool down completely, you can acid soak them and throw them into the electroplating machine following the guide in part 2. Beware the bullet diameter is intentionally undersized by 100um to make sure thick enough copper can be plated. You will have to leave the plating machine running longer and check a few bullets' diameters every few hours.



After plating is done, polish the bullets using your favorite method, size them if you have a sizing die, and then test a few by forcing them down a barrel manually. If they engage the rifling well and don't lose their plating, you have done an excellent job. You are now ready to use these bullets for reloading.

Test results:



LEE mold electroplated bullets Testing Results (5 grain Sport pistol powder):

Cathodes' Red Glock 17 (PF940V2 frame): 20 rounds, Tested to work. No malfunctions. No visible lead gunk in barrel after firing.

LEE mold electroplated bullets Testing Results (4.5 grain Sport pistol powder):

Cathodes' Red Glock 17 (PF940V2 frame): 30 rounds, Tested to work. No malfunctions. No visible lead gunk in barrel after firing.

Silicone mold electroplated bullets Testing Results (5 grain Sport pistol powder):

Cathodes' Red Glock 17 (PF940V2 frame): 17 rounds, Tested to work. No malfunctions. No visible lead gunk in barrel after firing.

LEE mold powder coated bullets Testing Results (4.5 grain Sport pistol powder):

Cathodes' Red Glock 17 (PF940V2 frame): 10 rounds, Tested to work. No malfunctions. No visible lead gunk in barrel after firing.

Cathodes' Nylon Glock 17 (Taluman Nylon 645 3D printed frame): 10 rounds, Tested to work. Some extraction Malfunctions possibly caused by the firearm. No visible lead gunk in barrel after firing.



Troubleshooting

Casting-----

My bullet comes out deformed/incomplete!

The lead is not hot enough, or you pour your lead into the mold too slowly. Heat up the lead more and pour faster.

My bullet comes out grainy and crumbles easily!

The lead is not hot enough. Let the lead heat up more. Alternatively, pre-heating your mold will help too.

My bullet comes out with protruding seams!

Your mold isn't clamped together hard enough. Squeeze the handles together when pouring.

Plating-----

Copper won't Adhere to my bullets and copper powder crashes out of the solution!

Your current is too high. Reduce your PSU's voltage across the electrodes. Your bullet's surfaces may not be sufficiently rough for copper to attach onto. Reduce your drum RPM should help too.

Copper won't form on the surface of my bullets!

Check your polarity. Make sure the Cathode makes contact with the bullets too. The bullets must be the Cathode for reducing the copper ions inside the solution.

My bullets come out with patches/uneven copper plating!

Your motor is either spinning too fast or way too slow. Adjust the motor's voltage to get a steady drum rpm. Try to use a fish tank pump to circulate your electrolyte if the problem persists.

My bullets lose their copper plating when they come out of the barrel!

Your plating isn't thick enough. Extend your plating time and try roughen up the bullets' surfaces more.

My bullets are too thick to be pressed into the brass!

You have plated too much copper. Reduce your plating time or sand your bullets pre-plating to compensate for the added copper. If you have a sizing die, use it to squeeze the bullet down to size.

My bullets come out of the electroplating machine all gray and oxidized!

Your electrolyte is either too diluted or is contaminated. Your anode may not be pure copper as well. Prepare new electrolyte and anode. Make sure your bullets are submerged during plating and not exposed to air.

Molding-----

My silicone bullet mold makes rough, irregular bullets!

You have too many air bubbles in your silicone. When casting silicone, you need to tap, flick, and smack the mold a little to get rid of the air. Brush a thin layer of silicone onto your 3d printed parts before pouring in a large amount of silicone helps too.

My silicone bullet mold makes incomplete / bubble filled / cratered bullets!

Your mold is not hot enough. Pull out the first batch bullets and pour a new batch. It should yield a better result once the mold heats up.

Powder Coating-----**The powder won't stick to my bullets!**

Try using a different plastic container. Some plastic encourages static electricity build up better than others.

My coating comes out too thin!

You didn't shake the bullets well enough. Bullets will pick up more powder when you shake them for longer.