

# Creation of Indium wire from scrap Indium

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## 1 Parts

The assembly consists of several parts. A brass outer casing, to which a smaller stainless steel bottom and a thicker stainless steel top hold in a stainless steel insert which is clamped onto a stainless plug when melting and a stainless nozzle when extruding. For extruding, there is also a small plug used to push on the indium, and a plunger to apply pressure to the plug. You need the following items:

1. Brass casing
2. Stainless bottom
3. Stainless top
4. Stainless insert
5. Stainless bottom plug
6. Stainless nozzle
7. Stainless small plug
8. Stainless plunger
9. Stainless hex head screws (6 long, 6 short)
10. Hotplate capable of  $> 500^{\circ} \text{C}$
11. Anti-scoring Extreme Pressure Lube #3
12. Scrap indium

## 2 Melting

With those parts in one place, you can begin to set up to melt the indium. First, the faces of the bottom plug, the upper face of the nozzle, the bottom face of the insert (the side away from the two circumferential notches), and the faces of the small plug should be cleaned to remove indium that would cause the pressure seal to be formed to fail. Using a material that won't score the metal, i.e. a coarse cloth or fine emery paper, polish the excess indium off. When polishing, do so in a circular pattern, as to not create radial paths for escape of the metal. When the pieces are polished, you can assemble the pieces. Insert the large plug and the insert, ensuring that the insert is placed in with the top up, and place the thinner bottom plate on the bottom, screwing in the shorter screws tightly and flush with the plate. Screw on the top, which will not go flush with the brass, securing with the screws. Tighten the screws in a star pattern, tightening alternate sides in a circle. Once tightened, place onto the hotplate, and turn it on to a high setting. Allow about an hour for the assembly to heat to the melting point of indium, about 430°C. You can then throw in the scrap indium, which will melt. Fill, leaving enough space to admit the entire small plug in the top of the insert column. Once full, turn the hotplate off, and allow about four hours for the whole thing, to cool down. Be careful not to touch the assembly, as it stays very hot for a while.

## 3 Extruding

You can now extrude the indium. Open the bottom, remove the plug from the bottom, and insert the nozzle, reattach the bottom and retighten the top. Put Extreme Pressure Lube #3 onto the bottom face and sides of the small plug, and place it inside the insert. The lube is very tacky, and very hard to get out of the tube, but use more than a thin coating. Gloves are suggested. It may be necessary to remove the top to place the plug into the insert. Once the assembly is reassembled and tightened, insert the plunger (once again the circumferential groove denotes the top of the plunger), and take to a two-ton press. Press on the plunger, and leave space below the bottom of the assembly for the wire to come out. Catch the extruded wire with paper towels or Kim-wipes, lay it out along the floor, and make sure the wire doesn't touch itself. Once all the metal is out of the assembly, pinch the wire off at the end of the nozzle, and fold the wire up in paper towels, making sure again that the wire doesn't touch itself. The metal is now wire, but work-hardened. It must anneal for several weeks at room temperature to become as ductile as is necessary.