

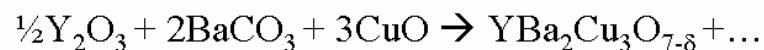
Synthesis of $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$

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Step 1: Solid State Reaction



You need

1.00 gm of Y_2O_3
3.50 gm of BaCO_3
2.11 gm of CuO

or weights in the
same ratios.



Step 2: Preparation

1. *Wear a dust mask.*
2. You need a clean mortar to hold the powders.
Put the pestle aside at this moment.



Step 3: Weighing

1. Put a clean wax paper on the top pan of the electronic balance. Press zero button: $\rightarrow 0 \leftarrow$.
2. Weigh each chemical and carefully pour all of it into the central area of mortar.



Step 4: Mixing and grinding

1. Place mortar (with powders), pestle & a stainless-steel lab spoon inside a “Ziplock” plastic bag.
2. Carefully zip-lock the bag with little air left inside.

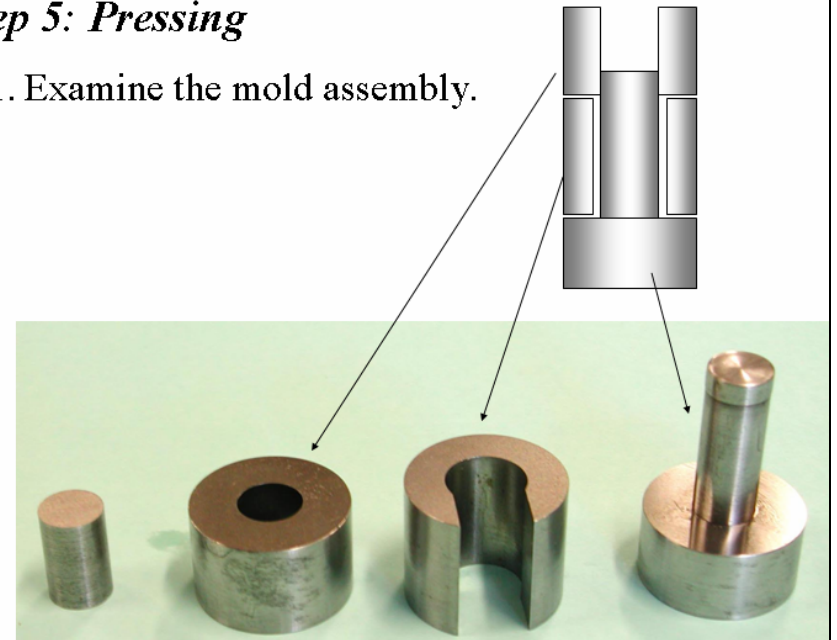


3. Use the spoon to mix powders thoroughly.
4. Grind powders rigorously using a pestle for at least 15 minutes.

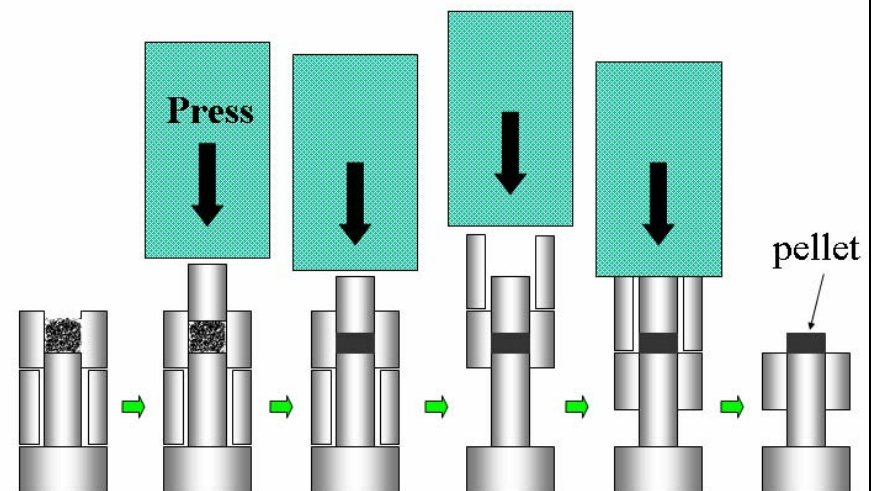


Step 5: Pressing

1. Examine the mold assembly.

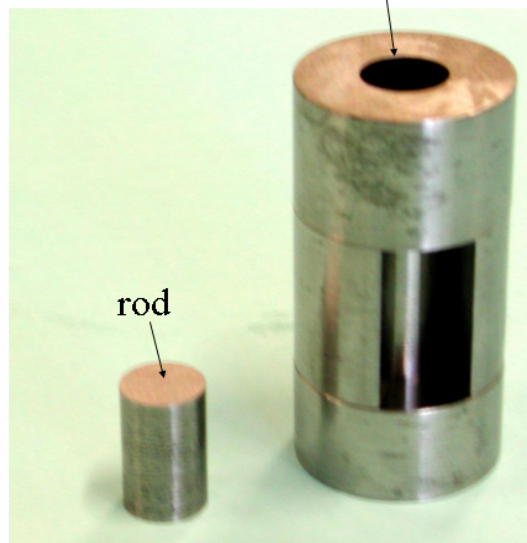


Steps in making a pellet:

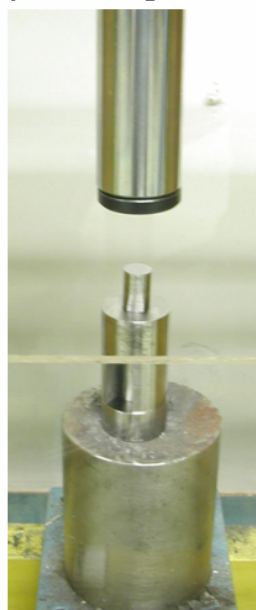
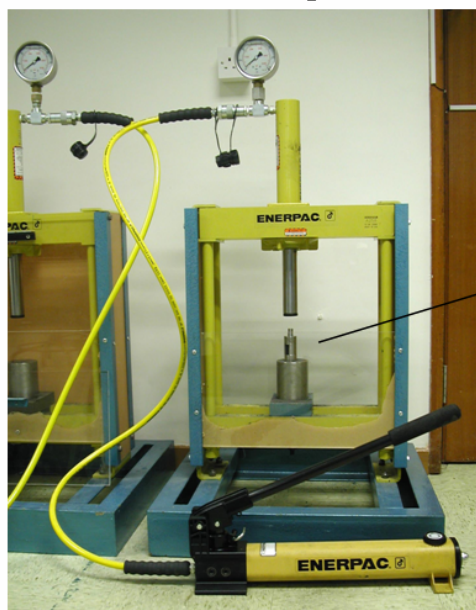


2. Put ~ 1 g of ground powder into the hole (~1 cm diameter).

3. Insert the rod into the hole.



4. Put the mold on the platform of the hydraulic press.



5. **Important! Close the plastic shield.**

Then apply pressure until the gauge reads ~ 500 bars (7000 psi). Wait for at least 0.5 minutes.

6. Release pressure. Reverse the mold to get the pellet.

7. Repeat all steps to make a thin sample (~0.5 g) for resistance measurement. Use our preheated powder.



Step 6: Heating

1. Put your pellets on an alumina (Al_2O_3) tray or boat.
2. Label their location on the logbook.
3. Our technician/TA will program the oven to heat pellets gradually to 950 °C in running air or oxygen, stay at that temperature for at least 3 hours and then cool them slowly to room temperature. (These samples may be oxygen-deficient. They can be fully oxygenated ($\delta = 0$) when heated at ~ 600 °C in running oxygen.)

Step 7: Cleaning up

Put the left-over powder into a designated bottle for future use.

Wash your hands.

Step 8: Testing

Please pick up and test your sample next week.
Good luck!