Making Foam Atoms and Laboratory Bags

In order to push the students to ask the relevant questions – about the weight and bonding properties of the foam atoms – the atoms should be as nearly identical as possible in all other characteristics: size, color, feel upon squeezing, and arrangement of the velcoins and glue. In this manner irrelevant clues are suppressed.

There must be lots of ways to make atoms that will work to teach the concept of atoms, bonding, and the periodic table. This is the way that I have developed. It works, and it results in atoms that cost about $0.10 each -- $0.08 of that is the steel core. I have assumed that – at some point -- students with throw the foam atoms at each other, hence the foam rather than some hard material. I have also assumed that some student will swallow one of the atoms [Don't laugh!], and hence the heavy atom core is steel rather than readily available lead shot, which could be toxic if swallowed.

The instructions come first. The list of suppliers is at the end.

Materials/Equipment Required

5/8" foam backer rod
0.28" glue sticks (multi-heat)
Jig block (see paragraph 2 of the instructions)
Glue gun (high heat)
Socket set screws – cup head – 3/8" x 16 x ¾". Purchase a socket key at the same time.
5/8" diameter velcoins – both loops and hooks, adhesive on one side

30 gallon black trash bags
Big rubber bands (comfortable fit on the wrist)
Masking tape

Instructions

1. To make 100 atoms you will need just over 6' of backer rod. Decide now how many light and how many heavy atoms you intend to make. 50/50 is a pretty good choice. Also decide how many loop and how many hook velcoins you intend to use. Again, a 50/50 choice is typical. These choices result in 25 of each the four types of foam atoms.

Figure 1: Backer rod – the raw material

Figure 2: Glue sticks package

2. The backer rod must be cut to ¾" segments. It is important that each segment be as close to ¾" as possible, with flat ends. To do this, I needed a jig block shown in figure 2. I made mine from a scrap piece of 2" x 4". Drill a 5/8" hole and a 5/16" hole all the way through the block. Make a saw cut exactly ¾" from one side of the block. Insert the backer rod (twist it back and forth a bit so that it does not compress), and use a paring knife (cut back and forth) to cut the backer rod.

Figure 3: Jig block

Figure 4: Backer rod segment

3. Plug in the glue gun and let it come to temperature.

Figure 5: glue gun

4. Now use the glue gun to melt a conical hole from each end of the foam segment. Do not squeeze the glue gun trigger.

   See figure 6. The left hand foam segment shows the foam after melting the conical holes with the glue gun, but before the residual material in the hole has been pushed out with a small rod. The hole in the right hand foam segment has been completed.

Figure 6: Holes melted in the foam

5. Now ready the cores. You will have to cut glue sticks into ¾" segments to make the light atom cores. Use the jig black (figure 3). The set screws are already 3/4" long.

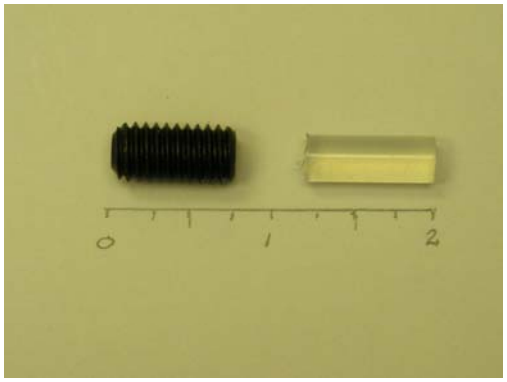

Figure 7: Foam and glue stick core

6. Figure 8 shows the cores partially inserted, and Figure 9 shows them fully inserted. The fit for the steel core is typically tight, and it may help to use the socket key to screw the steel core into the foam segment.

Figure 8: Cores partly in

Figure 9: Cores fully in

7. Now deposit a blob of glue on the one end of each atom.

Figure 10: With blob of glue

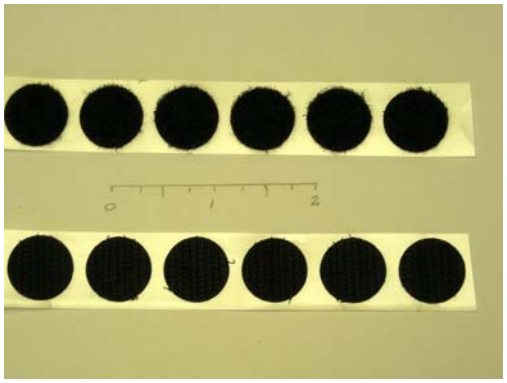

Figure 11: Velcoins

Before the glue hardens put the appropriate velcoin on top of the glue. Take care to get it aligned with the backer rod cylinder.

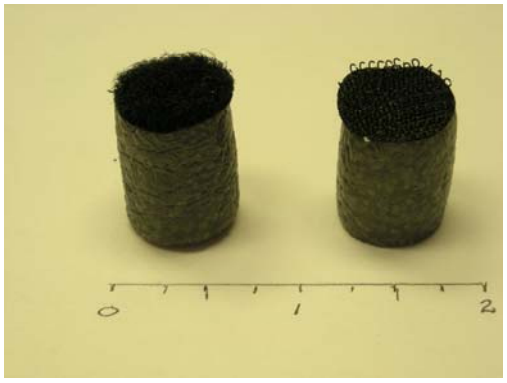

Figure 12: Velcoin on one end

8. Wait a bit for the glue to cool and harden. Then turn the atoms over and use the glue gun to deposit a somewhat larger blob of glue on the other end of the atoms. Do not put a velcoin on this end.

Figure 13: Blob of glue on other end

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9. The laboratory bags are made from opaque 30 gallon garbage bags. Cut the bag at its half-height point, and then, for each these two parts. Slit seams to make two long pieces, each of which is then cut into roughly equal thirds. For each of these six pieces, use masking tape to join two edges to make a cylinder with open ends. Bind each end with a rubber band.

Figure 14: Lab bag

10. For students just beginning to work with the foam atoms and laboratory bags, put six atoms in each bag, including one each of the four types of atoms. Make sure to make at least one hook-loop bond, so that the students have to encounter molecules.

Figure 15: Lab bag and typical contents (ruler for scale only)

Suppliers

(I have no financial interest in any of the suppliers mentioned.)

Backer rod – any hardware store. I got mine at Home Depot. Be sure to get 5/8" diameter

Glue gun (high heat) and glue sticks (0.28" diameter, multi-heat). Any crafts store. I got mine at Walmart.

Jig block – home made

Socket set screws [3/8" x 16 x ¾", cup head]. Look in the local Yellow Pages for suppliers of screws and bolts. Typically they are sold in lots of at least 100. The supplier can also sell you a socket key.

Velcoins – If you buy from a fabric store, you will pay about $0.10 per velcoin. If you buy in bulk, you can buy 1000 (of a particular type) for about $12.00, i.e., $0.012 per velcoin. Try http://feinersupply.com.

If you are in a bind, contact Lynn Melton.

Trash bags, rubber bands, and masking tape – grocery store, Home Depot, etc.

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