

Composite Clipboards

Objectives:

- To introduce students to the world of composites and some small finishing operations
- To introduce composite constituents, challenges, and benefits
- To gain a respect for safety and chemicals

Activity Description:

Students are brought into the classroom and a discussion is held about composites. What are they? How are they made? What types of things can be made out of composites?

Before beginning in the lab, while they're still in the classroom, the students get a safety briefing. The chemicals used in this process can be hazardous if not properly handled. Explaining the MSDS sheets is also helpful.

Once in the lab, each student is given a metal plate to clean with acetone. The cleaned plate is then coated with a release agent.

At this stage the students can cut up decorative items to become imbedded into their clipboards. I usually have items made from plastic, such as stickers or sayings, that the students can cut up. I get these items from craft stores. Paper items seem to become saturated with the resin and turn cloudy.

Once the items are cut out, I have the students mix their resin. I use steel cans from soup, chili, and the like. Each can must be labeled with the student's name, the date, and the material that will go into it.

I pre-cut the fibers for the exercise. Any fibers work, it's up to you. The students weigh the fibers and record it. The students will then use the same amount of resin as fibers. I use polyester resin for this activity for safety reasons. It is important to make sure that the resin does not have an air inhibited cure or you will end up with a sticky mess in the morning. Boating resin works well for this exercise.

The students pour the resin into the can and then add 1% MEKP to start the curing process. The resin is thoroughly mixed. At this point, the students only have about 30 minutes to complete the lay-up.

The students then brush a layer of resin onto the release coated area of their plate. Once this initial layer of resin is in place, they can add their decorative items. Then they brush another light layer of resin over the items and place the first layer of fabric down. Any number of plies and orientations can be used and

experimented with. Sometimes it's good to have students use different amounts of fiber and then compare the boards once their complete. Add resin in between each layer to fully saturate the layer. If the students run out of resin, they can get more. Try to encourage them to use the least amount of resin needed to saturate all of the fibers. They will get the strongest parts with as little resin as possible but enough resin to coat each fiber thoroughly.

Once all the plies have been used, you can let the resin cure overnight. Be sure to have each laminate labeled. Any extra resin should go into a water bath to cure in the can before disposing it in the garbage.

The next day, remove the lay-up from the plate. Clean the plate and remove any release agent still on the panel.

Trim the edges of the panel using a band saw fit with a very abrasive blade (sometimes called a composite blade). If necessary, file the edges smooth with a file or sandpaper.

Have the students mark the holes for the clip on their board using a permanent marker. Drill the holes using a drill press. Be sure to have a block of wood under the laminate to keep the hole from fracturing the back side of the composite.

Using a pop rivet gun and pop rivets, rivet the clip onto the board.

Grade Levels: 3-10 (3rd grade with more help, especially with the math)

Time Requirement: 2 hours day 1 (not including prep time), 1 hour day 2

Equipment & Supplies:

Band saw with composite blade, acetone, chip brushes, tin/steel cans, stir sticks, nitrile gloves, rags, polyester resin (not air inhibited), MEKP (usually comes with the resin), safety glasses, metal flat plates, pop rivets, pop rivet gun, drill press, drill bit, clipboard clips, sandpaper &/or file, release agent (such as PVA or wax), permanent marker, tape for labeling, MSDS sheets for all chemicals, fibers (any will work)

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