Course: Polymer Science (11546PB-2015)
Grade level: 10-12
Sources: Mississippi Polymer Science Instructors

Coatings Testing for Product Use
Teacher Instructions

The PBA project is designed to be embedded into normal instruction, meaning that course instructors can guide students through the project during class time. All student products are due to the RCU by 5:00 PM on Friday, March 22, 2018. Instructions for submitting student products can be found in the PBA Manual (http://rcu.msstate.edu/Assessment/Performance-Based-Assessment.aspx).

Essential question: How are coatings chosen and tested for use in product manufacturing?

Overview:

The teacher should select materials such as kilz in a can, acrylic paint, two-part epoxy resin (applied with a popsicle stick), and spray paint. These coatings will provide varied results.

Alignment:

- 21st Century Skills
  - CS6-16

- College and Career Readiness Standards
  - WHST.11.2 - Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

- CTE Curriculum Unit
  - Unit 9

Time requirements:
1-2 weeks or as appropriate for each district's schedule

Materials and resources:
- Physical Characteristics Test of Polymer Coatings http://www.pslc.ws/ret2003
- Substrates (whatever is available and appropriate: aluminum foil, glass plates, microscope slides, plastic sheets, aluminum Q-panels, etc.)

- At least three different types of paint or coatings (Kilz, Kilz spray, acrylic paint, tempera paint, spray paint, Turtle Wax, latex paint, epoxy, etc.)
- Paint brushes, sponges, popsicle sticks, or other applicators
- Newspapers for splatter control
- Scotch or masking tape
- Cutting tool: razor blade, scalpel
- Straightedge or ruler
- Calibrated drawing pencils (any)
- Sandpaper or abrasive paper (to get a flat tip on the pencil)
- Pencil sharpener
- Round objects of three different diameters (anything – markers, pencils, a pipe, but at least three different diameters)
- Graph paper
- Writing utensils
- Lab report guide (located on the PBA page of the RCU website: http://rcu.msstate.edu/Assessment/Performance-Based-Assessment.aspx)
- Additional materials as needed depending on student choice of additional tests

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Student Instructions

Essential question: How are coatings chosen and tested for use in product manufacturing?

Overview:

You are an analysis technician for a local paint company. You are looking for an existing coating that would be best suited to paint a plastic car for children. Complete experiments to examine at minimum, these three tests - adhesion (tape test), pencil hardness, and bend - on 3 samples of commercial coatings, such as Kilz paint, tempera, car wax, gloss enamel, acrylic paint, Krylon spray, and/or epoxy.

Prepare an investigative lab report for your employer explaining which coating is most suitable based on the data you collected. You must back up your recommendation with graphed data and logical reasoning. Include an analysis of your results and recommend any further testing needed to appropriately gauge the effectiveness of the coating for this particular application.

The information will be graded using the rubric provided.

(Suggested paint testing: bend, adhesion, shrinkage, indention, pencil hardness, scrub resistance, weathering, opacity, environmental.)

Part 1. Prepare samples for testing
For the minimum number of tests, you will prepare three samples (approximately 5cm x 20cm) for each chosen coating. If you choose to do additional tests, prepare samples accordingly. Consult your teacher for substrate options.

Part 2. Perform tests and collect data
Follow your teacher's directions to perform the tests and collect the data.

Part 3. Analyze data
Analyze data: Make a chart or graph to compare the data. Choose the coating that would be most appropriate for the given application, and back up your choice with observations and data.

Part 4. Prepare the report
Write a report including these components: problem statement, materials and procedures, data and analysis (to include graphs, charts, written explanations, pictures, etc.), conclusion and recommendation (defensible with data).

Part 5. Submit your work
Convert your document to a PDF to prepare it for upload. Name the PDF as your MSIS number, last name, and first name (ex. 000123456 Smith John).