
Term Project: Sugar (and/or protein) bonds and oily coatings

Goal: Make a strong, light-weight, water-proof wood composite out of popsicle sticks (4.5" x 3/8" x 1/16") only using the following items: sugar (confectioner, cane, brown, granulated, honey, maple syrup, high fructose corn syrup found in soda, or artificial sweeteners), flour/starch, cotton, copier paper, vinegar, baking soda, gelatin, egg, spider web, salt, pepper, sand, tea extract, vanilla, butter, olive oil or any other oil, and water. Note this list is not exhaustive, but confirm other natural ingredients. Specific panel dimensions—length is 11.5" (length = 3 sticks with an inch of overlap at each joint) and width is 1".

Purpose of the experiment: Basic off the shelf items that are biobased can be manipulated into materials that have some sort of adhesive properties or used to create a coating. However, there are no direct "recipes" of what may or may not work. This provides each team to think about what compounds they are using and how they can be manipulated in order to provide the needed adhesion to hold the popsicle sticks together and transform them into a solid structure. All work may be done out of the laboratory, in your kitchen, or in laboratory based on scheduled time with the instructor or TA. Students are encourage to be as creative as possible.

Evaluation of panel: The samples will be weighed prior to testing. Next, the samples will be immersed in room temperature water for five minutes then patted dry prior to testing. Finally the samples will be loaded until failure.

Tips and advice: Use any relevant scientific literature to come-up with ideas or even social media (YouTube etc.). Document all sources and provide credit to them in your project report. Do some preliminary screening to come up with combinations that do not work (and avoid those). Use heat as needed to either cook resin batches (non-stick frying pan could be your reactor) or cure the adhesive (hot iron could be your press). **Form a hypothesis** to organize your research and develop rationale that describes why the chosen approach should work.

Project evaluation: Each team will need to generate a two page report that consists of an introduction, materials and methods section, results and discussion section. The *introduction* needs to describe the purpose, scope, and significance of the project along with any sources used in the research. The *materials and methods section* should describe, in paragraph form, the materials used and where they were sourced from, and how they were transformed to make the panel. Describe also any special lay-up procedures and use a schematic as needed. The *results section* should include an image of the panel prior to testing with an appropriate caption along with the mechanical properties and the ratio of the properties to the mass of the panel. The *results section* needs to be in paragraph form and the results should be placed in context of other materials. The *discussion* should focus on an account of what the team members learned about wood adhesion and coatings as well as recommendations to improve upon the design. A rubric will be created to show how the projects will be assessed.

Project due date: Project due date will be agreed upon by the class and posted.