Improving the Ductility and Overall Usability of Casein Plastic Through the Addition of a Plasticizer

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Most plastics are made of polyethylene terephthalate, a polymer that is nearly indestructible, taking centuries to decompose. To be more environmentally-friendly, there are substitutes available, one being casein plastic, an organic material made from casein proteins found in milk. While utilized commonly in toys and decorative objects, its overall uses are restricted due to one major drawback, its brittleness. To overcome this, this project performs a multi-factor research to evaluate the efficiency of a new version of this biodegradable plastic made from liquid milk. It was hypothesized that the supplementation of glycerin, a plasticizer that acts as a lubricator, to the original formula of the plastic would help the casein bond easier, allowing for a more pliable material. Multiple tests strongly affirmed the glycerin-treated casein's superiority over the original formula as it had a stronger surface strength compared to its initial form. This was followed by experiments to establish the best ratio of glycerin to casein to create the most effective material. The applicability of the improved plastic in real-world scenarios, including biodegradability and solubility were also tested. Overall, the hypothesis was accepted as adding approximately 22mL of glycerin to 8 ounces of casein created a material superior to the original, although additional tests like flammability or tensile testing may be beneficial in further studying the extent of its uses. The contributions of this project help further the development and implementation of casein plastic, proving that it can be used for varying commercial purposes and be produced using household resources.

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