A Biodegradable Revolution: An Industrial Device to Produce Biodegradable Polymer Films

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The presence of petroleum-based synthetic polymers in the environment leads to soil and water pollution, threatens the ecosystem and leads to the destruction of fauna. The negative effects of plastics can be minimized by producing starch-based biodegradable polymers from liquid raw materials without toxic plasticizers. Thus, our aim is to create a prototype of a biodegradable polymer production device. For the device to produce qualitative polymers, different proportions of starch, glycerin, gelatin and water were tested. They were mixed in 2 separate reactors, then combined and left to dry in various temperatures on organic glass, regular glass and rubber. The obtained films were tested for elasticity, water solubility and decomposition in soil. After determining the proportions, the materials were tested for mixing in 1 reactor to determine how many reactors the device needs. The best weight ratio of starch, glycerin, gelatin and water was 1:3:8:45 respectively. The best drying conditions were 23°C (10 minutes to dry) and constant air flow from above to evaporate the excess water and organic glass as a drying surface. The films completely dissolved in water in 2-3 days. This data was used to design the device's 3D model with 1 metal reactor for mixing the raw material and with a closed train rail system to ensure the automatic continuous production of polymer films. There will be several portable railroad cars carrying an organic glass with the necessary thickness. The product obtained from the raw materials offered by this project is not inferior to artificial polymers in terms of its physicochemical data. The closed train-rail model of the device allows massive production without much industrial space, as the organic glass on the cars will be interchangeable.

Awards Won:
King Abdulaziz &amp
his Companions Foundation for Giftedness and Creativity: Full Scholarship from King Fahd University of Petroleum and Minerals(KFUPM) (and a $400 cash prize)