DocuSign Envelope ID: 537017B9-E66F-4AD3-B7BC-3E8822447952

Title: Fabrication of advanced self-folding agarose materials

Authors: Creston A. Singer and Dr. David Salas-de la Cruz

Abstract:

The alteration of materials to improve their properties can elicit unique behaviors applicable in technologies such as foldable touch screens, therapeutic delivery systems, and even novel architectural material. Of particular interest are materials obtained via renewable natural sources that have minimal environmental impact. Natural sources typically include plant products like cellulose, agar, carrageenan, and gum. These compounds are crucial for structural support and mobility in plants and can thus be modified for similar external uses. Alterations of such materials can result in even more intriguing characteristics like electrical and thermal conductivity as well as increased elasticity, plasticity, and durability.

This work aims to explore different ways to improve agarose hydrogel films. Agarose is the component of agar that is responsible for the high strength gelling properties of sea plants. Through the addition of a plasticizing agent and stabilizing agent, we were able to produce an agarose film that was self-folding and could withstand repeated bending, folding, being soaked in water, and dried without retaining any permanent damage. By varying the plasticizer and stabilizing agents, in addition to creating a bilayer with the addition of silk or cellulose films, we believe we can control and tune our agarose film's durability and folding nature. To understand the structural morphology of our agarose film, various analytical techniques were implemented including Fourier transform infrared spectroscopy (FTIR), thermal gravimetric analysis (TGA), and X-Ray scattering