Gelatinization and Hysteresis of Organic Compounds to Create Edible Shelf Stable Adhesives

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Everyone experiences the universal problem that limits food creation, food breaks. A prime example is the succulent burrito, filled with a pristine combination of fixings, that splits asunder with more drama than Julius Cesar. Humans have bandages, so why can't food? Food adhesives, a safe-to-eat fast-setting glue or tape, are the solution. Tapioca starch was used as it gelatinizes (bursts when heated to form a tacky substance). Agar (or agarose), which is a vegan gelling agent, was used to make the adhesive harden via hysteresis (the spontaneous aging of the gel by the expulsion of water). I hypothesized that a tapioca flour to water ratio of 1:1 with a concentration of 0.1M agar cooked on the stovetop will yield the best adhesion. Different ratios of tapioca flour to water, concentrations of agar, and preparation methods were experimented with to find the best adhesive for food. After experimentation and analysis using a custom-built test bench (which expanded upon the horizontal and shear test standards from ASTM), it was found what composition enabled the highest green strength and no cohesive failure. Also, it was found that microwaving (heat activation) was the best heating method due to the significantly longer shelf life the adhesives have in an unactivated form. A lower flour to water ratio (3:4) and a lower concentration of agar (0.01M) cooked in the microwave had the best shelf life and adhesion to a variety of textures.

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