Colorimetric Smart Packaging System: A Carbohydrate-Based Plastic Alternative for Detecting Food Spoilage

Zamora, Cuauhtemoc (School: Veterans Memorial High School)

Food safety is one of the most important components of human life. The World Health Organization estimates that foodborne contamination kills 420,000 people per year worldwide. To combat this problem, early detection of contaminated food is essential. To address this issue, a smart packaging system was developed using a pH-sensitive, carbohydrate-based film that changes color when food begins to spoil, and is also biodegradable. The film was developed by crosslinking guar-gum and chitosan, then adding a pH indicator made of bromocresol green and anthocyanins to the hydro-film, giving it the ability to change color. As food spoils, it releases compounds called amines, which have a high pH value. As the amines accumulate, the anthocyanins in the smart film change color, indicating food spoilage. The smart film was tested for its stability, ability to absorb water, and pH range. Its ability to detect food spoilage was tested by placing it in a petri dish with a fish sample and observing color change over the course of 10 days. Data collected from the tests showed that not only was the smart film able to change color in response to food spoilage, but it was also able to go 10 days submerged in water before showing signs of deterioration. The results indicate that this smart film could potentially be used as a visual indicator for food freshness. However, it is believed that its most promising application is in its ability to perform as an alternative to petroleum-based plastics for specific food-based usage.

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