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Polydiacetylene applications for food safety

Paul Dawson¹, Yueyuan Zhang¹, Inyee Han¹, Julie Northcutt¹, William Pennington¹ and Tim Hanks²¹Clemson University, USA²Furman University, USA

Polydiacetylenes (PDAs) are conjugated polymers exhibiting unique organizational and chromatic properties. PDA biosensors in the form of nanoscale vesicles have been successfully developed for bacteria detection, however applying biosensors in food processing environments is challenging and has not been previously reported. This study investigated the reaction of food sanitizers/surfactant with PDA vesicles. PDA vesicles were inkjet-printed, photopolymerized and characterized using dynamic light scattering (DLS) and UV/Vis spectroscopy. The effect of PDA vesicle concentration was first investigated with a two factor factorial design. Then, the effect of sanitizer/surfactant concentration and time on the vesicle's color was quantified. A mechanism for the color transition is also proposed in this study. Results indicated that Vigilquat and TritonX-100 reacted with PDA vesicles giving visible color change. Statistical analysis indicated that PDA vesicle concentration, sanitizer/surfactant concentration, and time all have significantly ($p < 0.0001$) effect on color change. As they are highly sensitive to the presence of Vigilquat and TritonX-100, PDA sensors could be used to detect chemical residues. This application of PDA vesicle-based biosensors should be considered for additional applications in the food industry.

Biography

Paul Dawson has been a Professor at Clemson University in the Food, Nutrition and Packaging Sciences Department since 1991. Prior to 1991, he conducted Post-doctorate research and completed his doctorate at North Carolina State University, Master of Science degree at the University of Florida and BS at Salisbury University (MD). His research focuses on Food Safety and Quality including specific areas of biosensors, active food packaging, refrigerated/frozen food shelf life and bacterial survival and transfer in food. He has authored/coauthored 113 refereed scientific publications, 18 technical book chapters and 152 scientific abstracts.

pdawson@clemson.edu

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