2022-11-07

Sodium Alginate, Nanoclay And Curcumin Based Food Packaging Material For Intelligent Food Packaging Applications

Kalpani Y. Perera
Technological University Dublin, d19129125@mytudublin.ie

Máille Hopkins
Technological University Dublin

Shubham Sharma
Technological University Dublin

See next page for additional authors

Funder: Technological University Dublin

62

Sodium Alginate, Nanoclay And Curcumin Based Food Packaging Material For Intelligent Food Packaging Applications

Mrs Kalpani Y. Perera[1,2,3], Ms. Máille Hopkins[1], Mrs. Sharma Shubham[1,2,3], Dr. Brendon Duffy[3], Dr. Amit K. Jaiswal[1,2], Dr. Swarna Jaiswal[1,2]

[1]School of Food Science and Environmental Health, Faculty of Science, Technological University Dublin-City Campus, Dublin 7, Ireland, [2]Environmental Sustainability and Health Institute (ESHI), Technological University Dublin-City Campus, Grangegorman, Dublin 7, Ireland, [3]Centre for Research in Engineering and Surface Technology (CREST), FOCAS Institute, Technological University Dublin - City Campus, Kevin Street, Dublin 8, Ireland

Key Words: Intelligent Packaging, Nanoclay, Sodium alginate, Curcumin

Abstract:

Bionanocomposite food packaging contains materials of biological origin which display high-performance activity when compared to biopolymers and are eco-friendly alternatives to conventional packaging materials. Intelligent packaging monitors the condition of the food or environment surrounding the food and communicates changes to the consumer. This study aimed to develop a bionanocomposite intelligent packaging material by utilising sodium alginate, nanoclay and curcumin. Sodium alginate (2 W/V% SA) film incorporated with 0.3 W/V% curcumin (Cur), glycerol, and nanoclay (NC) in various concentrations (0, 0.5, 1 and 2 W/V %) was prepared using the solvent casting method. The influences of nanoclay and curcumin on the optical, mechanical, physical, chemical, thermal, and pH sensing properties were studied. Results showed that the films were of high colouration and low transparency with a $\Delta E^* > 4$ as compared to the control film. Among all the developed films, the SA_Cur_2%NC film was the thickest (0.072 ± 0.00mm) and showed the most effective UV barrier property. It has been observed that with the increasing NC concentrations, transparency of the films decreased while there was an enhancement in the UV barrier property. SA_Cur_1%NC had the highest mechanical properties with high tensile strength (14.68 ± 1.06 MPa), elongation at break (3.31 ± 0.62%) and Young's modulus (0.93 ± 0.02MPa). When compared with the control film (SA_Cur_0%W/V NC) the tensile strength increased more than two folds. It has been observed that curcumin at 0.3 W/V% was an effective pH changing indicator which changes from orange to red in alkaline conditions. The developed film had an effective UV barrier property together with the enhanced mechanical properties and pH sensing ability and therefore can be used as smart packaging material. Further research is in the progress to incorporate the antimicrobial agent of the natural origin in the packaging film to bring antibacterial properties to the film.

Acknowledgement: The authors would like to acknowledge the funding from TU Dublin Research Scholarship 2021.