UNIVERSITI TEKNOLOGI MARA

SYNTHESIS AND CHARACTERIZATION OF CHITOSAN ALGINATE HYDROGEL COMPLEXES BY USING NOVEL IONIC GELATORS

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MSc

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AUTHOR'S OF DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non- academic institution for any degree or qualification.

I hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

This research is about the synthesis of a newly identified ionic gelator, i.e., calcium tripolyphosphate (CAT), and the preparation of a hybrid compound of chitosan/alginate hydrogel complexes using CAT and a commercially available ionic gelator, calcium pyrophosphate (CAP). Two different CAT and CAP concentrations were prepared, denoted as CAT1, CAT2, CAP1, and CAP2, resulting in a 0.05 M solution of both ionic gelators. CAT was characterised using inductively coupled plasma optical emission spectroscopy (ICP-OES), and the prepared hydrogel complexes were characterised using differential scanning calorimeter (DSC), thermogravimetric analysis (TGA), Fourier-transform infrared (FTIR), X- ray powder diffraction (XRD), and field emission scanning electron microscope (FESEM). The degradation temperature of the prepared hydrogel complexes is 288 °C, while the degradation temperature of pure chitosan is 293 °C and pure alginate is 235 °C. The FTIR analysis indicated protonated amine groups of chitosan, which reacted with the carboxylate groups of alginate. The absorption bands of the amino groups and amide bonds were identified and attributed to an ionic interaction between the carbonyl group of alginate and the amide group of chitosan, resulting in the hydrogel complexes. The DSC measurements further confirmed the interactions between chitosan and alginate. The T_m of the hydrogels of chitosan alginate is 124–140 °C, with CAT1 having the lowest T_m of 124 °C and CAT2 with the highest T_m, i.e., 140 °C. Microscopic images of the prepared hydrogel showed a rough surface compared to the images of individual chitosan and alginate compounds. Meanwhile, the XRD results proved that the chitosan alginate hydrogel prepared has a more amorphous nature than the pure chitosan alginate component, suitable for the adsorption process.

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