

**UNIVERSITI TEKNOLOGI MARA**

**PLASTICITY OF HOT AIR-DRIED  
MANNURONATE-AND GULURONATE-RICH  
ALGINATE FILMS FOR APPLICATION IN  
TRANSDERMAL DRUG DELIVERY SYSTEM**

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Thesis submitted in fulfillment of the requirements  
for the degree of  
**Master of Science**

**Faculty of Pharmacy**

**February 2011**

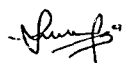
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## ABSTRACT

The plasticity of hot air-dried guluronate-rich (MG) and mannuronate-rich (MC) alginate films prepared from 2 and 4% (w/w) alginate solutions, which contained the same amount of polymer, through hot-air drying at 40 to 80°C were investigated. These films were subjected to thermomechanical, differential scanning calorimetry, fourier-transform infra-red, x-ray diffractometry, dimension, morphology, moisture content, viscosity and polymer molecular weight analysis. The water weight loss profile of alginate solution undergoing drying was recorded with time. The polymer weight of all solid films was kept constant. Film plasticity increased when dilute alginate solution and MC were employed in film preparation. This was due to decrease in polymer-polymer interaction at high strength domains of matrix involving C-H, O-H, C-O and/or C=O moiety of alginate, attributing to plasticization effect of water and ease of molecular rearrangement of alginate. The plasticity of film decreased with an increase in drying temperature from 40 to 60°C following heat-induced polymer-polymer interaction. A further increase in drying temperature to 80°C nonetheless greatly promoted film plasticity through air bubble formation and reduced alginate molecular weight in film. Drying of dilute alginate solution or at low drying temperature was accompanied by both constant rate and falling rate periods. The falling rate period dominated in drying of alginate solution of high polymer concentration and at high drying temperatures with internal diffusion being the governing transport phenomenon for water. Drying process of 4% (w/w) alginate solution at 60 and 80°C was relatively simple as there was only a single drying stage. Nonetheless, it could give rise to different product plasticities in spite of being convenience with respect to process control.

## ACKNOWLEDGEMENTS

All praise to Allah S.W.T., the Most Beneficent and the Most Merciful for giving me the health and strength to complete my Master's thesis.

Thousand thanks to Associate Professor Dr. Wong Tin Wui. As a supervisor to this study, he has given the fullest advice, encouragement, guidance and assistance in all aspects to make this study a success.

My gratitude is also given to Associate Professor Dr. Law Chung Lim from The University of Nottingham, Malaysian Campus as a co-supervisor to the study, for his support, assistance, guidance and advice throughout the project.

I am greatly indebted to the Research Management Institute (RMI), Ministry of Science, Technology and Innovation (MOSTI), Ministry of Higher Education as well as Faculty of Pharmacy, Particle Design Research Group and Non-Destructive Biomedical and Pharmaceutical Research Centre, Universiti Teknologi MARA (UiTM) for funding and facility support throughout the course of this project. The most special thank to Ms. Ekha Mardziah, Pn. Nurjaya Sumiran, Pn. Nor Khaizan, Ms. Aznida, and those behind the scene whose names are not mentioned here for their co-operation throughout the preparation of this thesis and project.

My heartfelt gratitude to my beloved family for their prayers and support has enabling me to succeed.

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