

**UNIVERSITI TEKNOLOGI MARA**

**DISSOLUTION OF CALCIUM IONS FROM  
ALGINATE MATRIX**

**NUR HAZIRAH BINTI KAMARUDIN**

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## ABSTRACT

The profiles of calcium ion leaching from alginate beads in relation to the property of dissolution medium modified by microwave were investigated. The beads were prepared by extrusion method with sulphanilamide, sulphathiazole and sulphamerazine as model drugs. The dissolution medium was subjected to microwave treatment at 80 W and 300 W. The profile of calcium release was determined by dissolution testing and atomic absorption spectrophotometry techniques. Untreated water possessed more dissolved carbon dioxide and thus led to the formation of carbonic acid. The protons from acid replaced calcium ions and increased the percentage of calcium release when relatively alginate sulphanilamide beads were concerned. The water treated by microwave at 300 W had sufficient kinetic energy to penetrate into the alginate beads. The kinetic energy of water enabled the polymer to loosen their matrix crosslinkages through dissociation of calcium ions from alginates beads. A more hydrophobic alginate-sulphathiazole bead required such water to induce calcium leaching. Lastly, in the case of alginate-sulphamerazine beads there was no apparent effect of dissolution medium treated by microwave on their calcium leaching profile.

# CHAPTER 1

## INTRODUCTION

Alginate is a polysaccharide found in brown seaweed (Phaeophyceae: *Laminaria hyperbores*, *Macrocystis pyrifera*, and *Ascophyllum nodosum*). Alginate is an unbranched binary copolymer composed of (1→4 linked) β-D-mannuronic acid (M) and α-L-guluronic acid (G) residues of widely composition and sequence. Alginate is regarded as a true block copolymer consisting of homopolymeric M and G blocks interspersed with regions of alternating structure MG blocks. The distribution of the two monomers determines the physicochemical properties of alginates. Alginate is widely used in food technology as thickening and dispersing agent. In the pharmaceutical field, alginate is extensively used as alginate-based drug delivery system.

Microwave is a high frequency electromagnetic radiation with frequency ranging from 300 MHz to 300 GHz. Vibration of molecules by induced or permanent dipoles is a result of microwave transmission. The quantity of the microwave absorbed by the object affects the intensity of molecular vibration. The amount of energy absorbed depends on the shape, size, and the extent of intermolecular binding and polarizability of the object. Microwave is applied in many fields such as food technology and pharmaceuticals manufacturing, biomedical therapy, pharmaceutical analysis and drug synthesis.