# TITLE:

PRELIMINARY STUDY ON THE SELECTION OF SELF-HEATING ELEMENTS IN SELF-HEATING PAD

## SUPERVISOR:
## DR NUR SYUKRIAH AB RAHMAN

## SCHOOL OF CHEMICAL ENGINEERING
## COLLEGE OF ENGINEERING

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# ABSTRACT

Self-heating food packaging comprises of a heating pad and the food itself, which is heated by the food warmer provided. The meal warmer or heat pack is an active module that may generate heat without the need of external heat sources, a process known as an exothermic reaction. The Kembara meal pack is the most prominent implementation of this technology. This invention is excellent and practical for travel since it will help to re-heat the meals quickly and safely. Therefore, this study aimed to discover the best chemical composition of Citric acid with Sodium Hydroxide, Calcium Oxide with Sodium chloride and magnesium, Hydrochloric acid with sodium hydroxide and Sodium hydroxide with water to develop a self-heating pack for re-heating purposes of food. The most suitable characteristics of the heating pack is a reaction that can achieve higher final temperature with lower duration to rise and longest duration sustain at the highest temperature. The reaction of Citric Acid with Sodium Hydroxide was activated with 100ml and 200ml of water with each of temperature reaction occur was recorded. The result in this study indicated that the combination of 20g of Citric Acid with 60g NaOH in 100 ml of water exhibited the highest temperature 120°C with the time sustained at highest temperature is 5 minute and took about 10 seconds to rise the highest temperature. Meanwhile, the lowest temperature was recorded is 41°C and it took around 13 minutes to reach the temperature when 40g of calcium oxide with 20g of magnesium and 10 g of sodium chloride were combined with 100 ml of water.

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# BACKGROUND

## 1.1 Introduction

Food packaging with the potential to self-heat can heat the food inside without the use of external energy or sources. The self-heating food package typically consists of two components: the meal itself and a self-heating pad. The self-heating pad typically found in an outer layer enclosing the heat source and the food will be produced through an exothermic process. By adding a precise volume of liquid, the exothermic reaction between the ingredients inside the self-heating pad can be started (ex: water)

These self-heating food containers have historically been utilised extensively in military operations, during natural catastrophes, or wherever there are insufficient supplies of conventional cooking equipment. However, the use of self-heating food packaging has been expanded to include today's busy consumers' leisure and travel needs, which fit with their modern always-on lifestyles.

Instant Maggie is currently one of the most well-liked instant foods among consumers because of its delectable flavour and simplicity to make. In fact, most of the today's manufactured instant maggie.

However, heat must be used to cook meal rather than a typical environment.

## 1.2 Literature Review

### 1.2.1 LR subtopic 1 (History of self-heating pack)

For more than 50 years, self-heating food technology has been researched and developed. Millions of these cans were utilised during the war when research on self-heating food technology produced an acceptable reaction mixture for heating food components in 1950 (Caldwell and Gillies 1950).

While in the UK, it was revealed that the self-heating can was first developed as a military strategy and then made available to the general people, including products like soups and beverages (Anon, 1960). There are currently a vast range of commercially accessible self-heating products on the market, including both food and beverages. Oliver-Hoya et al. (2009) used a self-heating beverage and Meals Ready to Eat (MRE) as examples in a classroom activity to illustrate a real-world chemical challenge.

An exothermic reaction is the only type of heat source that can be used to heat food on its own. There are several options for heat output, but the most reactive reaction is always the most hazardous since it may be poisonous and produce unwanted gaseous by-products. The most suited substance or elements have been discovered to be calcium oxide (quicklime) and water due to their safety, affordability, and ease of availability. Additionally, the reaction they create has no negative side effects on the environment (Poonia & Singh, 2015)

Various methods, such as those using edible oils, brine, water, and other sauces, are used to can tuna. The first tuna in a can was released in 1904. Tuna cans were sold in 700 cans the first year, and by 1914, output had increased to 400,000 cans. The high protein and low-fat content of tuna in a can was praised. The microwave is one of the simplest and quickest ways to reheat canned tuna.