

# CHAPTER I

## INTRODUCTION



Soybean oil is triglycerides, which consists of glycerol and several different fatty acids. There are more than 90 percent of C18 atom fatty acids such as linolenic acid (C18:3), linoleic acid (C18:2), oleic acid (C18:1) and stearic acid (C18:0). Soybean oil is produced in Thailand and easily available, and used as an essential substance in food, cosmetic, surfactant, medicines and other industries. However, soybean oil contains high contents of polyunsaturated fatty acid. Therefore, it is oxidized easily and thus the flavor stability is decreased. Oxidative stability can be improved by partial hydrogenation, which reduce some of the double bond in soybean oil structure.

The hydrogenation of soybean oil is a very important operation in the chemical and food industry. The catalyst used in the industrial processes for hydrogenation of vegetable oil, are nickel[1-3], copper[1], palladium[1,4] catalyst deposited on support, such as silica[5], kieselgurh[6], alumina[7] and carbon black[8], but these supports are quite expensive. Natural silicates in Thailand are cheaper and easily available. However, these natural silicates in Thailand have not been used as support for metal catalysts in the hydrogenation of soybean oil or any other vegetable oils. Therefore, It would be very interesting to apply these natural silicates as a support for catalysts in the hydrogenation of soybean oil. Their activity and selectivity would be investigated.

In the present study, the activity and selectivity of nickel deposited on natural silicates in Thailand for hydrogenation of soybean oil were studied. The nickel catalysts to be examined in this study including three supports, which are ball clay, china clay and diatomite available as natural silicates in Thailand. Dry impregnation method was used to prepare catalysts.

### **1.1 The objectives of this study**

1.1.1 To prepare the nickel catalyst on natural silicates for hydrogenation of soybean oil.

1.1.2 To study activity and selectivity of nickel on natural silicates for hydrogenation of soybean oil.

1.1.3 To study the optimum conditions for selective hydrogenation of soybean oil and the chemical properties of soybean oil after the hydrogenation.

### **1.2 The scopes of this study**

1.2.1 Preparing several in-house catalysts by using the impregnation method and then characterized them by:

- Atomic Absorption Spectroscopy
- BET method

1.2.3 Selecting the optimum operating conditions by varying these following parameters:

- kind of the supporter (ball clay, china clay and diatomite )
- amount of catalyst
- reaction temperature

- reaction period
- hydrogen pressure

1.2.4 Comparing the results from different kinds of catalysts to those reported for the best commercial catalyst available.

1.2.5 Studying the chemical properties of soybean oil after the reaction.

- Iodine value
- Chemical composition