

**UNIVERSITI TEKNOLOGI MARA**

**SYNTHESIS OF NATURAL  
SUPERABSORBENT ORGANIC  
HYBRID AEROGEL FROM SODIUM  
ALGINATE-SOY PROTEIN ISOLATE**

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## ABSTRACT

The aerogel now become most famous thing from drug delivery carrier to superabsorbent. The superabsorbent made from the sodium alginate aerogel allow it to absorb water up to higher ratio per weight. But nowadays, there is an issue of oil become a threat in many processes such as wastewater. The high content of oil will hinder the process of treating the wastewater. The usage of oil superabsorbent has known to be expensive in cost and cannot be use more than once. By using sodium alginate and soy protein isolate, the sol-gel technique is applying to form superabsorbent to absorb oil. However, this can be done by soaking the hydrogel with Methyltrimethoxysilane (MTMS), Tetra Ethyl Orthosilane (TEOS) and ethanol with ratio of 1:1:2. The aerogel is left in room within 24 hours after surface modification. The aerogel combine with MTMS does affect the shrinkage at it lower shrink percentage by 5-7%, able to get hydrophobic aerogel with angle 112.5o and 117 o with oil absorption above 40%. The hydrophobic superabsorbent can be made although it is not able to absorb much compare to superabsorbent.

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# CHAPTER 1

## INTRODUCTION

### 1.1 Research Background

Superabsorbent has been quite a unique innovation to simpler absorbent. The usage of super absorbent is depending on their purpose. Some are used to remove heavy metal, dye or even separate water from saline water. The dependent of this may vary based on their properties. Rather that, it must be noted the superabsorbent among them came with two versions either in hydrogel or powdered aerogel. Hydrogel is a substance that contain water molecule inside the substance to maintain the shape while aerogel is basically the hydrogel after the moisture content has been removed.

Aerogel is the fibre like material that use either organic or inorganic substances. The production of the aerogel may different because usage of inorganic material such as silica aerogel or maybe an organic material such as the polysaccharide such sodium alginate aerogel. The process of making the aerogel is by sol-gel process where the solution is made by dissolving the material used to make a gel like structure which is done by using crosslinking which used to bind the chain of polymers using metal cation such as Zinc and Calcium.

The application of aerogel is wide due to the fact that it can be used for many separation process. Usually, aerogel of sodium alginate is hydrophilic which absorb water molecules even better. This is useful to extract water especially in oil-water solution or water that has greater concentration of organic and inorganic solvent such as dye. The aerogel can be useful as it can absorb more than its weight ratio. This surely helpful in absorb the water concentration such as removing water from seawater.

The main issues involving the aerogel is that structural strength is the main weakness as the aerogel is fragile. Due to volume of air is 99% of its structure (Crystall, 2014), it may break if heavy load of pressure and stress is applied to it. Furthermore, the density of the aerogel can increase which is can become disadvantages as some of the aerogel tend to be light weighted so that it can be easily carry around or bring it especially being as absorbent. The most important thing for aerogel is that the reduction of porous size distribution inside the aerogel. This would be bad as the higher pore size distribution in the aerogel allow high volume of absorption up to many time of its weight.