UNIVERSITI TEKNOLOGI MARA

FRACTIONAL CRYSTALLIZATION FOR WASTEWATER TREATMENT FROM FOOD INDUSTRIES:
EFFECT OF OPERATION TIME AND SOLUTION CONCENTRATION.

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ABSTRACT

Fractional crystallization is a process where the water component in a solution is frozen and crystallized as ice so that the more concentrated solution will be left behind. This process is used to recover the water component in the waste solution from food industries during the wastewater treatment. . Large amount of water is needed by the companies in food industry as ingredient of their product, production process and for cleaning of raw materials, machines and equipment. Progressive freeze concentration (PFC) method which is the division of fractional crystallization process was used for this analysis. The experiments were carried out to examine the effect of operation time and solution concentration on fractional crystallization process for the wastewater treatment. The performance analysis was executed by using glucose solution as simulated wastewater and was evaluated by the value of effective partition constant, K and percentage of water recovery, R_w. Operation time studied was recorded optimum efficiency at 15 minutes with high purity of ice formed, lowest K-value of 0.49 and highest water recovery of 42%. 1000 mg/L showed the optimum concentration for solution concentration studied with the best separation efficiency. It was recorded the lowest K-value of 0.271.

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INTRODUCTION

1.1 BACKGROUND STUDY

Over the past 30 years, Malaysia has developed quite rapidly. However, such a rapid growth has led to serious and critical environmental concerns of the issue of water pollution. One of the industry that can led to this problem is food processing industry because wastewater from food industries has high concentrations of biochemical oxygen demand (BOD), suspended solids, oils, greases, nitrogen and phosphorus. The concentrations are extremely variable and strongly affected by the specific production cycle and its phases.

Food can be contaminated by protozoa, viruses and pathogens that may be spread from contaminated water. It might lead to widespread acute and chronic illness if it is use as drinking water or in food preparation. The structure and tastes of food is influenced by water. For any consequences, the presence of organic matter, taste, color and odor are unacceptable in water that be used in food and beverage processing operations, and it must be removed.

In the industrial process, water is normally being recycling within an industrial plant. The development of wastewater treatment systems can help to solving the pollution problem. Fractional crystallization in wastewater treatment can be applied to wastewater by separating