UNIVERSITI TEKNOLOGI MARA

FRACTIONAL CRYSTALLIZATION FOR WASTEWATER TREATMENT FROM FOOD INDUSTRIES: EFFECT OF OPERATION TEMPERATURE AND SOLUTION FLOWRATE

SITI NURAJJAR BINTI JAMI

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ABSTRACT

In food industry, one of the problems constituent to it is the production of wastewater as by-product, in which this problem contributed to the severeness of the environmental quality, specifically water pollution, as well as to the human health. It is a challenge for researchers around the world to develop effective technology to address this problem. Crystallization technique is seen as one of the potential techniques to deal with this issue. In this work, progressive freeze crystallization (PFC) technique was studied for its effectiveness in wastewater treatment for food industry. In this process, a single layer of ice crystal formed on the surface of the crystallization vessel, making it easier to separate ice crystal from the concentrated solution. The effects of operation temperature and solution flowrate to the effective partition constant, K and solute recovery, Y were investigated to indicate the efficiency of the PFC process on glucose solution as the modeled wastewater sample. It was discovered that lower operation temperature and higher solution flowrate causes K value to decrease while Y value increased, indicating higher efficiency. The highest efficiency was found at the operation temperature of -10^{o}C with K and Y values of 0.4902 and 1.0048 respectively and at solution flowrate of 500 rpm, where K and Y values were 0.6521 and 0.9041.

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CHAPTER ONE
INTRODUCTION

1.1. SUMMARY

The physical and chemical characteristics of wastewater from food industry has contributed to the destruction of the environment as well as the population. Thus, a proficient wastewater treatment technology need to be developed. Crystallization technique has attracted many attention from researchers around the globe to be implemented in the treatment of wastewater streams from many industries including food industry. One of the crystallization techniques, progressive freeze crystallization (PFC) has out shined among the types of crystallization techniques due to its advantages, like high efficiency, low energy consumption and low maintenance cost. In this project, the process was applied to treat a modeled sample of wastewater from food industry. The optimum operating conditions were determined from this experiment, in which the performance of PFC was investigated at varied operation temperature and solution flow rate. The effects of these varied operating conditions were analyzed through the changes in effective partition constant, K and solute recovery, Y.