PROCESSING TECHNOLOGY FOR RECOVERY OF VALUE-ADDED LIPID INGREDIENTS FROM TWO WASTE STREAMS CREATED DURING EDIBLE OIL REFINERIES

Background

Oil is a daily food ingredient that we take. The oil we buy at the supermarket is light yellow, transparent and with low viscosity. However, we may not know that the oil from freshly pressed rapeseed is yellow to brown with high viscosity. This freshly pressed oil contains some lipid ingredients, which could result in bad quality and shorter shelf life. Therefore, in industry, we always remove these lipid ingredients by using several steps. During each step, we create a waste stream. We call them waste streams because we set the final refined oil as the reference. In fact, these streams contain some value-added lipid ingredients.

In my project, I will recover some high value components from two selected streams in lab-scale at first and then scale-up to a production level at the end. It will benefit both the environmental and economical for our society.

Lecithin production from gums

If you are used to reading the ingredient statement of chocolate, ice cream, cookies etc., you may find lecithin almost exists in any food. Why is this ingredient so widely used? It is because of the unique property that helps oil and water mix together. But how do we produce this ingredient? Where does it come from? That is one of my projects.

Degumming is one step for oil refinery. During this step, gum which looks like gel and is very

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sticky is produced. The gum contains the above mentioned valuable lecithin. This project focuses on efficient separation of lecithin from the other components and recovery of lecithin. The separation is similar to separating apples, pears, and oranges from a mixture of fruit, but using different techniques.

In the following steps, we purify the recovered lecithin by using no harmful solvent such as ethanol. This step can be viewed as classification of the separated apples by different sizes or colors. Meanwhile, enzymatic technology will be used for modification of the recovered lecithin. It is analogous to changing the apples into apple vinegar by using fermentation.

Rapeseed lecithin shows unpleasant taste, although it is safer than soybean lecithin when considering the genetic modification organism concerns. In this project we will also develop a method to identify the compounds which result in unpleasant taste especially bitterness. Further a new process should be developed to solve this problem.

The developed technology will ultimately be transferred to pilot-scale and industrial-scale step by step. Therefore, some technologies such as equipment, design of factory, etc. are involved as well.

Phytosterols and tocopherol production from deodorizer distillate

Deodorizer distillate (DOD) is another waste stream from deodorization process. During this step, the oil is kept under high vacuum and high temperature for the purpose of removing free fatty acid, phytosterols and tocopherol. Therefore, the DOD contains phytosterols and tocopherol which are of high value if the purity is relatively high. We will use a technique that alters the boiling point of fatty acids significantly and then it could be easily removed. It is like when we get salt from seawater by evaporating the water by using the property that the boiling point of water is much lower than that of salt. The rest of the DOD contains large proportion of phytosterols and tocopherol. We further refine it using some physical way such as cooling and crystallization. This process commonly takes place in our daily life. For example, when we put honey in freezer, some solid appears.

In this project, we also tend to recover the high value ingredient from DOD. The techniques should be scaled-up and create economic benefits at the end.

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