Purification of Biotechnological Carboxylic Acids with Adsorption Method Using Single Walled Carbon Nanotubes

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Adsorption is a very important and valuable method for separation carboxylic acids from aqueous solutions. In this study, single walled carbon nanotube was used as a sorbent for this purpose. Glycolic acid, lactic acid, tartaric acid and citric acid were adsorbed with SWCNT. The equilibrium time and the adsorption capacity at three different temperatures (25°C, 35°C and 45°C) were investigated. Reaction kinetics and the diffusion between the acid molecules and SWCNT pores were investigated. The aim of this study is determine the adsorption capability of SWCNT for biotechnological carboxylic acids from their fermentation media.

Carboxylic acids have wide range of application fields, such as pharmaceutical, polymer, food, etc. Because of this reason, recovery of carboxylic acids is an important process in chemical engineering. In this study, two monocarboxylic acid (glycolic acid and lactic acid), a dicarboxylic acid (tartaric acid) and a tricarboxylic acid (citric acid) were adsorbed from their aqueous solutions by SWCNT. All these acids are produced with fermentation method. Purification of the carboxylic acids from fermentation broth is very struggled process. The adsorbents must have selectivity for these acids.

Carbon nanotubes (CNTs) have porous-rich structures. That means they have very high adsorption capabilities and CNTs can be used for removing many kinds of organic and inorganic pollutants [1,2]. In this study, SWCNT showed good performance for adsorption of carboxylic acids without activation. For example, 0.01 g. SWCNT adsorbed 0.0021 g. lactic acid/ 1 mg. SWCNT. This adsorption process fitted Langmuir isotherm, as shown in Figure 1. If temperature is increased, adsorption capacity of SWCNT decreased. And when the initial acid concentration increased, the acid percentage of removed from aqueous solutions decreased.

As a result of this study, it is understood that SWCNT can be used as an adsorbent for carboxylic acid. But this adsorbent needs to modify for this purpose. SWCNT has many kind of modification procedures. The adsorbates properties can help for chosen most suitable procedure.

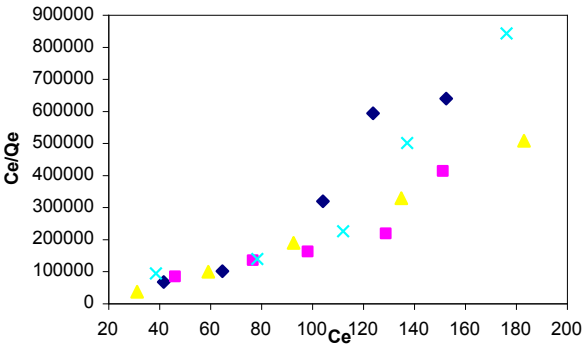

Figure 1. This figure shows that the Langmuir isotherms of the acid-SWCNT adsorption at 318 K. The labels in the figure exhibit the acids, ■. Lactic acid, ♦. Citric acid, x. Glycolic acid and ▲. Tartaric acid.

References

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[2] C.Lu, F. Su, *Separation and Purification Technology*, *58* 113-121, (2007).