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속보

산업생산 제조조건에서의 나트륨 디아세테이트 합성

전명래 · 주 군 · 노경호*
인하대학교 화학공학과, 고순도분리연구실
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Direct Synthesis of Sodium Diacetate in Industrial Production Process Control

Minglei Tian, Jun Zhou, and Kyung Ho Row*
Department of Chemical Engineering, Inha University, Incheon 402-751, Korea
**E-mail: rowkho@inha.ac.kr*
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Sodium diacetatic (SDA) is a product from the hydrogen binding reaction of sodium acetate and acetic acid. It is a high-performance preservative agent[1-3] and it has several characteristics: 1) Trophicity. It is an additive in animal feed to increase the trophicity of animal feed effectively. And the animal feed which contains the SDA can improve the growth of pigs and milk performance. 2) Special taste. The sour taste of SDA can cover all the bad odor of other synthesis additives in the feed. 3) High-performance. The efficiency of SDA is much higher than traditional preservative agents. For example, the dosage of SDA is only half or one third of sodium propionate and the price of SDA is much lower. 4) Security. SDA has no toxic effect to human and animals.

Right now, the production technologies of SDA are acetic acid-sodium acetate solution-phase combinatorial synthesis method, acetic acid-sodium acetate vapor synthesis method, aceticanhydride-sodium acetate solution-phase combinatorial synthesis method, acetic acid-aceticanhydride-sodium acetate solution-phase combinatorial synthesis method, and acetic acid-sodium carbonate synthesis method.[4-9]

Acetic acid-sodium carbonate synthesis method was widely used now. Production cycle of this method was short and product yield was high. So this study was to optimize the conditions in the synthesis process.

Principle of synthesis process

$$4CH_3COOH + Na_2CO_3 \rightarrow 2CH_3COONa{\cdot}CH_3COOH + H_2O + CO_2$$

After the charging the reactants into the reactor, the product was synthesized and drying according to the equilibrium. The pure product can be obtained after cooling.

Synthesis process

Pure acetic acid was added into the reactor. First, water/acetic acid (92:8, v/v) was mixed with pure acetic acid. Then sodium carbonate was added and stirring at the same time. After charging, because of the exothermic reaction, the temperature inside of the reactor will be increased to 80 ~ 90 °C. The temperature should be fixed until the reaction was finished. After the reaction was finished, the powder of product should be dried under 30 ~ 40 °C.

***Table* 1.** Effect of solvent/solid ratio of product yield

No.	Solvent/solid ratio (mol : mol)	Component of product (ratio of weight)					
	AA[a] : Na_2CO_3	AA (%)	NaAC[b] (%)	pH	Water (%)	Metal ion (%)	Formic acid (%)
1	8.861 : 1	89.86	10.14	4.89	0.3	0.00025	0.05
2	8.916 : 1	89.91	10.08	4.72	0.2	0.00025	0.05
3	8.927 : 1	89.93	10.07	4.65	0.2	0.00025	0.05

[a]acetic acid. [b]sodium acetate

RESULT AND DISCUSSION

Effect of solvent/solid ratio

Table 1 shows that different amounts of SDA can be obtained by different solvent/solid ratio. The results reveal that acetic acid: sodium carbonate (mol : mol) = 8.916 : 1 is the optimum ratio.

Effect of order of the reactants

In the reaction, the order of the reactants can affecpt the purification of the product. The water/acetic acid (92 : 8, v/v) should be added into the reactor before sodium carbonate. Because after the sodium carbonate added into the solvent, SDA can be synthesized and dissolved in water at the same time. After the reaction finished, SDA will be recrystallized from the water.

Reaction time and temperature

When the temperature in the reactor was higher than 90 ^{o}C, the reactants will be destroyed. In the other hand, if the temperature was lower than 80 ^{o}C, there was no enough energy to continue the reaction. Also the reaction time was fixed as 30 min. If the time was too long, the production cycle will be increased. And if the time was too short, the product yield will be decreased.

Optimum temperature and time of drying stage

If the temperature was higher than the boiling point of acetic acid, large amount of the unreacted acetic acid will be discharged into atmosphere during the drying stage. If the temperature was lower than 30 ^{o}C, the drying time will be too long. So the temperature was fixed between 30 and 40 ^{o}C, and the drying time was fixed at 7.5 h.

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