

## I Brief Introduction to the Production Method of Methionine

There are three kinds of methionine in China, that is, DL methionine, L methionine and D methionine. According to its application fields, methionine can be classified into two grades, feed grade and food/pharmaceutical grade. And the production methods for feed grade methionine and food grade and pharmaceutical grade methionine are different, with the former adopting synthetic method and the latter grade adopting enzyme method.

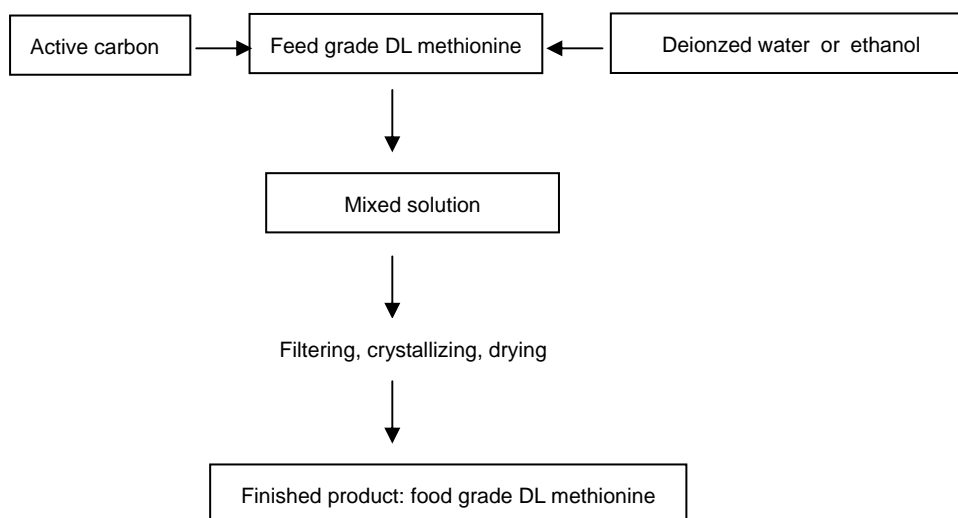
Before 2000 China produced feed grade methionine by synthetic method in Tianjin Rhone-Planc, but since 2000 China only produces food grade and pharmaceutical grade methionine by refining and feed grade methionine stopped in China and all the feed grade methionine in China is imported.

Therefore, only the methods for food grade and pharmaceutical grade methionine are introduced in the following.

### - Food grade and pharmaceutical Grade DL Methionine

In 2007, all the domestic food grade and pharmaceutical grade methionine is manufactured by refining the imported feed grade methionine. The production method is as follows.

Figure I-1 Flowchart of Refining Process for Food Grade DL Methionine Production



The above flowchart is adopted by all the food grade and pharmaceutical grade methionine manufacturers. Among different manufacturers, the production methods are mainly different in the solvents used (deionized water or ethanol) and in the crystallizing temperature.

### III Current Production Situation of Food and Pharma Grade Methionine in China

#### III -1 Summary of manufacturers

99 companies are reported to be engaged in the methionine business. However, until June 15<sup>th</sup> of 2007, 67 of them are finally excluded because they are not producing food and pharma grade methionine at all. 32 companies are finally confirmed to be still producing methionine now.

Table III -1.1 Brief introductions to these reported methionine manufacturers

Types of Companies	Active	Stopped	Trader	Never Engaged	Out of Contact	Feed-grade
Number	32	4	31	28	3	1
Total						99

Each of these 99 manufacturers has been interviewed through extensive telephone calls.

- ✓ If they are producing (at least in the beginning of 2007), their detailed production situation is discussed.
- ✓ If they have stopped production, more investigations have been carried out to find out why.
- ✓ If they are potential manufacturers or just have plans, the exact progress of the current situation has been undertaken.
- ✓ If they are traders of methionine, the market information is discussed.

Most of the companies have been telephoned at least twice or even three times.

It is estimated that the production volume of methionine of these 32 active manufacturers accounts for 96-98% of the total production volume of methionine in China.

#### VIII-3 Consumption in flavor

*Note: Flavor in this part refers to savory flavors used in food, such as beef taste flavor, pork taste flavor, chicken taste flavor, fish taste flavor, seafood taste flavor, etc. It does not refer to fragrances and essence in cosmetic and cleaning products*

Methionine is mainly used in the production of savory flavor including beef taste flavor, pork taste flavor, chicken taste flavor, fish taste flavor, seafood taste flavor, etc.

Flavor industry is the second largest consumption field of food grade and pharmaceutical grade methionine. In flavor industry, it is DL-methionine that is widely used instead of L-methionine. The main reason is that the price of L-methionine is more expensive than that of DL-methionine.

With DL-methionine as the raw material, the flavor producers only need to adjust the added percentage of methionine and don't need to adjust the production technology.

The consumption volume of methionine in flavor was 18.3 tons in 2006, increasing by 14% over the previous year. The fast growth rate shows that food industry has pushed the fast development of food additives including flavor.

Though the growth rate of food grade and pharmaceutical grade methionine consumption in flavor is fast, the total consumption volume is small. The consumption volume in 2006 account for only 15.25% of the total food grade and pharmaceutical grade methionine consumption, because the unit consumption volume of methionine in this field is small.

Figure VIII-3.1 Consumption volume of methionine in flavor from 2001 to 2006

