

PURIFICATION OF TECHNICAL CARBOXYMETHYL CELLULOSE SODIUM BY USING SULFURIC ACID

Goyibnazarov Ilkhom Shukhrat oqli

Institute of polymer chemistry and physics of Uzbekistan
Academy of Sciences

E-mail: igoyibnazarov@bk.ru

Nishanova Saodat Ravshan kizi

Institute of polymer chemistry and physics of Uzbekistan
Academy of Sciences

Yuldoshov Sherzod Abdullaevich,

Institute of polymer chemistry and physics of Uzbekistan
Academy of Sciences, PhD, senior researcher.

E-mail: [sherzodbek\)y@mail.ru](mailto:sherzodbek)y@mail.ru)

Sarimsokov Abdushkur Abdukhalilovich,

Institute of polymer chemistry and physics of Uzbekistan
Academy of Sciences, Professor.

E-mail: sarimsakov1948@mail.ru

TECHMIND-2021



Abstract

This article describes the conditions and advantages of purifying technical Na-CMC using sulfuric acid. In the sulfuric acid purification method, technical Na-CMC is converted to a water-insoluble H-CMC form and the concentration is achieved by washing in water to remove an organic and inorganic salts mixture. H-CMC, which is insoluble in purified water, is converted to Na-CMC water-soluble form using an alcoholic sodium hydroxide solution. By using this method, it was possible to obtain a high-purity product and reduce energy and material consumption.

Keywords:

Carboxymethylcellulose, purification, mineral acids, IR spectroscopy, sulfuric acid method

Introduction

Purified Na-CMC producing countries are mainly France, Germany, China, Finland, the Netherlands and Mexico. These countries are supply purified Na-CMC to other countries [1].

It is known that the technical Na-CMC purity level is not produced on the basis of special requirements, therefore, depending on the application, it is important to remove heavy metal salts from its composition [2].

Na-CMC, which has a high purity degree, is used for pharmaceuticals and food. Na-CMC mineral acids with high purity are used [3].

The effect of different mineral acids on the technical Na-CMC purification process was studied, and it was found that the effect of the acids was different. Therefore, different concentrations solutions of acids were used in the cleaning process. The influence of mineral acids with Na-CMC can be seen in the table below.

Influence of mineral acids on technical Na-CMC

Nº	Acid	Concentration, %	obtained product	Product yield, %
1	Nitric acid	10-50	Gel	-
2	Acetic acid	10-25	Gel	-
		30	Powder	40
		35	Powder	32
3	Orthophosphate acid	10	Gel	-
		15	partial-Gel	30
		20	Powder	48
		25	Powder	37
4	Sulfuric acid	10	Gel	-
		15	partial-Gel	24
		20	Powder	43
		25	Powder	34

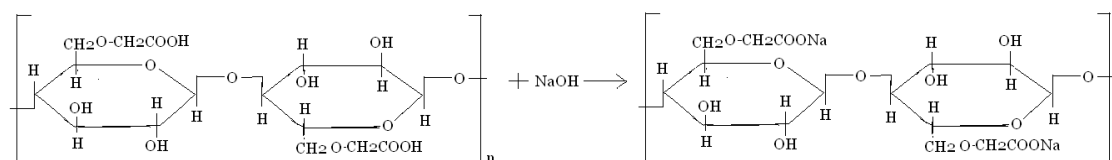
As can be seen from the table, the Na-CMC mineral acids influence had a different appearance. The most influenceive purification method with mineral acids was found to be the sulfuric acid method. Technical Na-CMC was reacted with 20% sulfuric acid in a 1:10 modulus ratio for 2 hours. The H-CMC obtained in the reaction was removed from the additional salts by washing in water. The purified H-CMC reaction with sodium hydroxide was carried out for 2 hours to obtain a completely soluble product Na-CMC.

The temperature influence on the polymerization degree of acid purification was studied. A decrease in the degree of polymerization (DP) was observed during the purification process using sulfuric acid of the same concentration as the temperature increased.

The influence of DP purification temperature using sulfuric acid

Nº	DP of technical Na-CMC	Temperature, °C	Treatment time, in hours	DP
1	810	20	2	600
	210			200
	340			300
2	810	25	2	570
	210			200
	340			290
3	810	35	2	550
	210			190
	340			280
4	810	40	2	500
	210			190
	340			250

Technical Na-CMC samples with the same degree of polymerization can be seen to have a decrease in the polymerization degree during purification with sulfuric acid at different temperatures. The polymerization degree is explained by the macromolecule destruction and the additional salts removal from it. The fully purified N-CMC was converted to a water-soluble Na-CMC form using a 6% sodium hydroxide solution. The reaction can be expressed schematically as follows:



The purified H-CMC was reacted with alkali in the dried and wet state. At the same time, the Na-CMC solubility obtained from wet H-CMC increased with increasing alkaline concentration.

The Na-CMC molecules obtained from the dried H-CMC reaction with alkali were insoluble. This is due to an intermolecular bond formation as a result of N-CMC molecule drying at 100-105°C obtained from technical Na-CMC. During high-temperature drying, water molecules containing H-CMC are released and a weak hydrogen bond between the carboxyl concentration and hydroxyl ions becomes a strong covalent bond. As a result, cross-linked Na-CMC molecules are formed, that is, the reaction does not take place at all the H-CMC reaction centers during the alkali treatment. Therefore, Na-CMC obtained from dried H-CMC is insoluble.

Na-CMC derived from wet H-CMC was found to contain no additional chlorine ions. In this purification method, a reduction in alcohol consumption and an increase in the purity degree were achieved.

References.

1. Yuldoshov Sh.A., Sarymsakov A.A. Investigation of the purification process of technical carboxymethyl cellulose using mineral acids // *Universum: Chemistry and Biology: Electronic Scientific journal*.2020. № 3(69).
2. Yuldoshov Sh.A., Saipiev T.S., Sarymsakov A.A., S.Sh. Rashidova "A new method of obtaining purified CMC for the pharmaceutical and food industries", *Uzbek. chemical journal. special edition*, 2011, -p. 229-231.
3. IAP 06198 S.Sh. Rashidova, Sarymsakov A.A., Saipiev T.S., Yuldoshov Sh.A., "Method for obtaining purified Na-CMC" 13.03.2020, *Bull.* №4.