

# Получение натрия сульфата.

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- Поскольку сульфат натрия - это соль, образованная сильным основанием  $\text{NaOH}$  и сильной кислотой  $\text{H}_2\text{SO}_4$ , ее раствор имеет показатель рН, близкий к нейтральному. То есть индикаторы типа лакмуса и фенолфталеина в растворе этой соли не меняют цвет.

- Sodium sulfate is the sodium salt of sulfuric acid. When anhydrous, it is a white crystalline solid of formula  $\text{Na}_2\text{SO}_4$  known as the mineral thenardite; the decahydrate  $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$  is found naturally as the mineral mirabilite, and in processed form has been known as Glauber's salt or, historically, sal mirabilis since the 17th century.
- Another solid is the heptahydrate, which transforms to mirabilite when cooled. With an annual production of 6 million tonnes, it is a major commodity chemical product.

- Промышленный способ – взаимодействие серной кислоты с хлоридом натрия при высоких температурах (порядка 550 градусов). Реакция идет следующим образом:
- **$2\text{NaCl} + \text{H}_2\text{SO}_4 = \text{Na}_2\text{SO}_4 + 2\text{HCl}$**
- About one third of the world's sodium sulfate is produced as by-product of other processes in chemical industry. Most of this production is chemically inherent to the primary process, and only marginally economical. By effort of the industry, therefore, sodium sulfate production as by-product is declining.
- The most important chemical sodium sulfate production is during hydrochloric acid production, either from sodium chloride (salt) and sulfuric acid, in the Mannheim process, or from sulfur dioxide in the Hargreaves process. The resulting sodium sulfate from these processes are known as salt cake.
- **Mannheim:  $2 \text{NaCl} + \text{H}_2\text{SO}_4 \rightarrow 2 \text{HCl} + \text{Na}_2\text{SO}_4$**
- **Hargreaves:  $4 \text{NaCl} + 2 \text{SO}_2 + \text{O}_2 + 2 \text{H}_2\text{O} \rightarrow 4 \text{HCl} + 2 \text{Na}_2\text{SO}_4$**

- In the laboratory it can also be synthesized from the reaction between sodium bicarbonate and magnesium sulfate.
- $2\text{NaHCO}_3 + \text{MgSO}_4 \rightarrow \text{Na}_2\text{SO}_4 + \text{Mg(OH)}_2 + 2\text{CO}_2$
- Formerly, sodium sulfate was also a by-product of the manufacture of sodium dichromate, where sulfuric acid is added to sodium chromate solution forming sodium dichromate, or subsequently chromic acid. Alternatively, sodium sulfate is or was formed in the production of lithium carbonate, chelating agents, resorcinol, ascorbic acid, silica pigments, nitric acid, and phenol.
- Bulk sodium sulfate is usually purified via the decahydrate form, since the anhydrous form tends to attract iron compounds and organic compounds. The anhydrous form is easily produced from the hydrated form by gentle warming.



- В лабораторных условиях, можно получить сульфат натрия, воздействуя серной кислотой на соду кальцинированную (натрий углекислый). Реакция идет до конца, поскольку в результате образуется слабая угольная кислота, которая сразу же разлагается на воду и углекислый газ:
- $\text{H}_2\text{SO}_4 + \text{Na}_2\text{CO}_3 = \text{Na}_2\text{SO}_4 + \text{H}_2\text{CO}_3$
- $\text{H}_2\text{CO}_3 = \text{H}_2\text{O} + \text{CO}_2$

□ Можно получить сульфат натрия также с помощью реакции нейтрализации (взаимодействием едкого натра с серной кислотой):



□ The second major production of sodium sulfate are the processes where surplus sulfuric acid is neutralised by sodium hydroxide, as applied on a large scale in the production of rayon. This method is also a regularly applied and convenient laboratory preparation.

