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Obtaining Magnesium Compounds Based on the Processing of Rapa

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One of the main directions in economic development is the integrated use of local raw materials and the creation of production technology that can replace competitive imported products. The next important priority for the long-term perspective, which is of decisive importance in increasing the potential, power and competitiveness of our country, is active investment for the implementation of strategically important projects aimed at the modernization of the main leading industries, technical and technological renewal, development of transport and infrastructure communications. is to carry out the policy [1].

Since the production of bischofite and halite by recycling rapa requires a large amount of electricity, a method of obtaining magnesium hydroxide is proposed. In this case, it is possible to obtain magnesium hydroxide by recycling natural salt solutions containing chlorides and sulfates of sodium and magnesium, as well as other impurities. The proposed method is simple, does not require large expenses, is considered effective, works continuously, allows for process intensification, energy consumption per unit product is reduced, low waste is produced, the method is designed for complex processing of chloride-sulfate rapa. The technology is a closed chain and provides the possibility of complex processing of chloride-sulphate rapa according to a single technological scheme, obtaining individual components of high purity at the level of the requirements of State standards. The use of distiller's liquid as a desulfurized reagent, that is, the use of waste from the production of soda ash (9-10 m^3 of distiller's liquid is produced for the production of 1 t of soda ash) requires special sludge storage facilities, which can be an environmental hazard for those around the enterprise [2].

Therefore, it is necessary to solve the problems related to environmental protection and reduce the cost of chemical products.

The method is eliminated in the following sequence:

1. Natural salt water - desulfurization of Karaumbet or Borsakelmas lake rapa (containing sodium and magnesium chloride and sulfates) with distiller's liquid. Calcium sulfate (gypsum) precipitates.
2. Gypsum crystals are separated from the liquid phase after settling.
3. Gypsum sediment is filtered, the resulting filtrate is combined with the liquid phase of 2 stages.
4. The resulting liquid phase is treated with sodium hydroxide or calcium hydroxide.
5. The resulting magnesium hydroxide precipitate is separated from the liquid phase.
6. The precipitate of magnesium hydroxide is separated, dried and burned at 600-800 °C, magnesium oxide is formed.
7. After separating the magnesium hydroxide precipitate, the remaining liquid phase is given to the production of soda ash. This method is carried out according to the Solve method. At the end of the process, the remaining solution is returned to the process in order to desulfate the initial salt solution [3].

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In the example of the following reaction, we determined the amount of sodium hydroxide by precipitating magnesium ions:

$Mg^{2+}2NaOH=Mg(OH)_2 \downarrow +2Na^+$

Precipitation of magnesium ions is carried out at 25 °C. Table 1 shows the indicators of precipitation of magnesium hydroxide with sodium hydroxide.

Table 1. Indicators for the precipitation of magnesium hydroxide with sodium hydroxide

Mass, kg		Relative Stoichiometric Amount %	Liquid phase composition, %					γSO^{2}_{4} relative, %	Mass $Mg(OH)_2$ kg
rapa	NaOH		Na^+	Mg^{2+}	Ca^{2}+	Cl^-	SO_4^{2-}		
1000	75,22	95	9,73	0,37	0,57	15,88	0,18	75,12	43,12
1000	79,18	100	10,04	0,37	'0,04	16,03	0,18	98,16	56,35
1000	83,13	105	10,23	0,37	0,01	15,98	0,18	99,41	57,06
1000	87,09	110	10,42	0,37	0,01	15,92	0,18	99,53	57,13

allows the formation of insoluble colloidal precipitates by combining with charged additives.

Filtration is usually done after the fermentation process. In this case, water is cleaned from suspensions through sand filters and other filters.

Using chemical methods, it is possible to soften the water by removing calcium and magnesium salts. In this method, reagents that form insoluble, precipitated calcium and magnesium salts are added to water. Depending on the reagent used, it can be divided into: slaked lime, soda phosphate (trisodium phosphate), natron (caustic sodium) methods.

The following reactions occur during the process:

1. Working with slaked lime (temporary loss of hardness)

$Ca(HCO_3)_2 + Ca(OH)_2 = 2CaCO_3 \downarrow + 2H_2O$ (1)

$Mg(HCO_3)_2 + 2Ca(OH)_2 = 2\ CaCO_3 \downarrow + Mg\ (OH)_2 + 2H_2O$ (2)

$CO_2 + Ca(OH)_2 = CaCO_3 + H_2O$ (3)

2. When treated with soda (removing permanent hardness of water)

$MgSO_4 + Na_2CO_3 = MgCO_3 \downarrow + Na_2SO_4$ (4)

$MgCl_2 + Na_2CO_3 = MgCO_3 \downarrow + 2NaCl$ (5)

$CaSO_4 + Na_2CO_3 = CaCO_3 \downarrow + Na,SO_4$ (6)

3. When treated with trisodium phosphate (Sa2+ and Mg2+ cations are precipitated in amounts up to 0.03 mg eq/dm3).

$3Ca(HCO_3)_2 + 2\ Na_3\ PO_4 = Ca,\ (PO_4)_2 \downarrow + 6\ NaHCO_3$ (7)

$3MgCl_2 + 2\ Na_3PO_4 = Mg\ (PO_4)_2 \downarrow + 6\ NaCl$ (8)

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The extremely low solubility of calcium and magnesium phosphates determines the high efficiency of the phosphate method [4].

Solubility in water (in 1000 g)-52.8 (0 ℃), 54.5 (24 ℃), 73.0 (100 ℃), in highly hygroscopic boiled solutions (containing 50.7 and 85b5 g of $MgCl_2$ in 100 g of water) 142b5 and 158 ℃; d^{25} boils at 161198 j 1.1757 and 1.2979 ℃ in aqueous solutions of 14%-20% and 32%. Solid, density (26g Mg Cl_2 in 100g water) -33.6 ℃. If it is higher than 1600 ($MgCl_2$), it is partially hydrolyzed in water. Final aqueous solution ($MgCl_2$), MgO. dissolves $MgCl_2$.mMg$(OH)_2$ from the obtained solution. H_2O crystallizes, where m=2-9, a n=2-8. these compounds are part of magnesium cements.

$MgCl_2$ is naturally occurring in the form of the mineral bishofite, $MgCl_2$. $6H_2O$, met, carnallite. KCl $MgCl_2$ $6H_2O$, chloromagnesite $MgCl_2$ is found in seawater. It is found in salty hands, in underground pits.

$Mg(OH)_2$ is a colorless crystal with a density of 2.36 g/cm^3, C^0r 77.11 D j(mol/k) above 350 ℃ and decomposes into MgO and water. $MgCO_2$ is formed by absorbing CO_2 and H_2O from the air. Hardly soluble in water (2.10-4 mol/l) (20 ℃), a weak base with a high concentration of boiling alkali forms hydroxomagnesite with its solution.

$MgSO_4$. colorless crystal, water solubility 35.5 (20 ℃)68.3 (100 ℃) in 100g water, boiled saturated ert (75g $MgSO_4$100g water) 108 ℃ hydrates are completely dehydrated at 320-330 ℃. Hexahydrate does not crystallize in aqueous solution at room temperature, hexahydrate at higher temperature than 480C, monohydrate at higher temperature than 67.5 ℃, these hydrates are completely dehydrated at 320-330 ℃. Anhydrous $MgSO_4$ crystallizes into MgO, SO_2 and O_2 at 1100-1200 ℃. By reacting with C at 700-900 ℃,

$(2MgSO_4+C \rightarrow 2MgO+2SO_2+CO_2)$ (9)

NatSO_4.$10H_2O$ crystallizes at low temperatures in aqueous solutions of $MgSO_4$ and aCl. Sulfates are determined by weighing. They are based on the precipitation of sulfates with barium chloride in an acidic medium and weighing the precipitate. Chlorine was determined by volumetric argentometric method. The method is based on the change in color of silver chloride precipitate suspension, silver ions interacted with potassium bichromate. The solid, water content samples were dried in ovens at 100-105 ℃ to constant mass.

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