To sum up, if batteries are disposed correctly by transferring them to disposal facilities, a significant reducing of harmful substances ingress into the soil will be achieved. Developing two directions is reasonable: modernization of recycling technologies as well as production technology [6]. Thanks to the cutting-edge technologies zero emission of harmful components can be achieved. If manufacturers focuse on invention of more effective technologies that will have the effect of preserving, the risks of harm to the environment are going to be reduced. The invention of a new type of battery can revolutionize not only the automotive industry but also the field of mobile electronics.

References

1. Виробництво акумуляторних батарей для електромобілів завдає величезної шкоди навколишньому середовищу. URL: https://sunnik.com.ua/issledovanie-proizvodstvo-akkumulyatornyh-batarej-dlya-elektromobilej-nanosit-ogromnyj-vred-okruzhayushhej-srede/ (Last accessed 26.10.2021).
2. Шкода літій-іонних акумуляторів. URL: https://voltmarket.ua/vred-litievykh-akkumulyatorov (Last accessed 15.10.2021).
3. Чи є літій-іонні батареї в електромобілях пожежонебезпечними? URL: https://voltmarket.ua/vred-litievykh-akkumulyatorov
4. Литий-ионные аккумуляторы для электромобилей 2021-2031. URL: IDTechEx (Last accessed 24.10.2021) .
5. Electric cars and batteries: how will the world produce enough? URL: https://www.nature.com/articles/d41586-021-02222-1 (Last accessed 26.10.2021).
6. Глобалізація — це інтеграція економік і суспільств у всьому світі, що посилюється. URL: https://www.un.org/ru/youthink/globalization.shtml (Last accessed 15.10.2021).

Language adviser: *Zaitseva N V., Senior Lecturer, Department of Foreign Languages, Dmytro Motornyi Tavria State Agrotechnological University*

MODERN METHODS OF SEAWATER DESALINATION

Levadnii O.O., *alexland.music@gmail.com*
Dmytro Motornyi Tavria State Agrotechnological University

The shortage of fresh water is a real threat for the entire planet. The world knows such ways of solving the problem as transporting icebergs, transferring runoff from high-water rivers, and desalination, but they are not used in all parts of the planet. There is a sufficient amount of enough sea water, mineralized and waste waters and desalination would make it possible to forget about fresh water shortages forever.

In order to implement all possible programs to restore the planet's water resources, it is necessary to use highly efficient desalination technologies. It is worth noting that these technologies must be cost-effective, so that desalination can produce inexpensive water of the same quality as natural fresh water and of the same usefulness to humans.

Desalination is removal of salts from water, preparing it for technological and domestic use. It means separation of water molecules or withdrawal of salt ions from the liquid. By extracting water molecules from the solution, a considerable amount of energy is wasted, because the aggregate state of the solution changes. Extracting salt from the solution does not change its aggregate state, but the energy expenditure is even greater [1].

48% of this water is produced in North Africa and the Middle East, 18.4% in East Asia, 11.9% in North America, 9.2% in Europe as a whole, including 5.7% in Spain.

The list of available technologies including distillation or thermal processes, membrane methods, freezing (requires high costs either for freezing or for defrosting ice), ion exchange (ion exchange resins have a short life, and also require regeneration with acid and alkali solutions) are of limited use. Let us look at each method in detail.

The desalination process aims to remove excess salt from the water, thereby making it fresh and, accordingly, suitable for cooking and drinking. It is possible to desalinate both sea water and water from artesian wells. If the salt content in the water does not exceed 1000 mg/l, it can be consumed [5].

Membrane methods are increasingly being used for seawater, perhaps almost all new seawater desalination systems are based on membrane technology. Reverse osmosis involves the use of a semi-permeable membrane which allows mainly water molecules to pass through, as well as some small molecular weight ions. The principle of reverse osmosis means that the solvent (water) from a more concentrated medium tends to be released into a less concentrated one. It is important to note that for brackish and salty water, special membrane elements are used, which have a high selectivity for sodium and chlorine ions. Membrane distillation is a thermal membrane method of desalination which works similarly to osmosis, but not through a concentration gradient but through a temperature gradient – water vapor is released through a semi-permeable membrane, while the solution remains outside. Electrodeionization works due to electrolytic water separation and ion-selective processes, it allows obtaining water with low mineral content [2].

Another popular method of desalination is the use of electromagnetic filters. This group of methods is also referred to as reagent-free methods. Both reverse osmosis and nanofiltration can be used here.

The next method of desalination is also quite interesting. The salty water is first subjected to boiling, and then to condensation. During the boiling process, the salts do not evaporate from the surface of the water, which has been scientifically proven – the water itself has to evaporate. The resulting steam is cooled in special chambers where the condensation process takes place. As a result, the steam turns into water, flowing down the walls of the chamber without any extra salt in its composition.

The freezing method is similar to the evaporation method described above. In this method, salty water is frozen. Fresh water has an interesting feature that it freezes before salts. This helps to pick out the frozen ice cubes before the entire surface is frozen. As you can easily guess, the ice cubes consist of fresh water [5].

The work of MIT engineers with an unusual desalination method led by Professor Martin Bazant was published in the journal Environmental Science and Technology. According to Bazant , this is a fundamentally new separation process, unlike any other. It provides membrane-free separation of ions and water molecules. In conventional electrodialysis, the vessel for separation is made of semi-permeable membranes. The filtering membranes allow water to pass through and retain the larger salt particles. These membranes are arranged alternately and divide the total volume into many cavities. A direct electric current is passed through the bath with the solution, which sets the ions of the dissolved salts in motion. The oppositely charged ions move in opposite directions, but because the bath is filled with membranes that impede the movement of the ions, the ions are trapped on the nearest membrane corresponding to their charge, and remain in the cavity between the two membranes. As a result, the concentration of ions increases between one pair of membranes (this water is discharged back into the sea) and decreases between the other, i.e. fresh water is obtained.

In the new process, called shock electrodialysis, water flows through a frit, a porous ceramic material. The mass of the material is confined on both sides by electrodes. A sufficiently strong direct current flowing between the electrodes causes a shock wave to occur in the flow, clearly dividing the flow into two parts – one of which is extremely salty and the other fresh water [3].

Engineers at Aalto University in Espoo, Finland, have developed a very interesting method for desalinating seawater. The innovative system does not need electricity for the desalination process. The idea is as follows. A special platform is made that is installed in the coastal area and moves in the rhythm of the waves. The wave that hits the platform is subjected to a lot of pressure, and through

the pipes it enters the filters, which are located on land. It is essentially the same as reverse osmosis system: salty water is pressed through semi-permeable membranes, the salts are separated and discharged back into the sea or ocean, thereby becoming desalinated. The only difference of this installation is that no energy resources are used to create this very pressure. Finnish engineers have calculated that manufacturing and installing one platform will cost $3.5-7 million, depending on its location. If you compare it with existing desalination plants, the benefits are clear. For example, the water pipeline in Päijänne, Finland, which provides water to Hal and its suburbs, spent 200 million euros. Desalination plants are very much in demand in countries with access to the sea or the ocean, but which have scarce freshwater reserves due to its geographical location [4].

References

1. *Опреснение морских и соленых вод. Системы обратного осмоса. Установки обессоливания.* (n.d.). Oil-Filters.ru. Retrieved October 28, 2021, from https://oil-filters.ru/reverse_osmosis_systems/

2. *Опріснення морської води*. (2016). Ecosoft.ua. Retrieved October 28, 2021, from https://ecosoft.ua/ua/blog/opresnenie-morskoy-vody/

3. *Учёные разработали два новых метода опреснения воды.* (n.d.). Habr.com. Retrieved October 28, 2021, from https://habr.com/ru/post/386527/

4. *Новий спосіб опріснення води - Оазис*. (n.d.). Oasiswater.com.ua. Retrieved October 28, 2021, from http://oasiswater.com.ua/uk/content/103-noviy-sposb-oprsnennja-vodi

5. *Современные методы опреснения и химический анализ воды* (2020). Panor.ru. Retrieved October 30, 2021, from https://panor.ru/articles/sovremennye-metody-opresneniya-i-khimicheskiy-analiz-vody/33078.html

Language adviser: *Suprun O.M., Senior Teacher of the Department of Foreign Languages, Dmytro Motornyi Tavria State Agrotechnological University*

CHOCOLATE AS A PRODUCT FOR FUNCTIONAL NUTRITION

Mandziy M.V., *margaritasmiley16@gmail.com*
Dmytro Motornyi Tavria State Agrotechnological University

The problem of food production with functional properties has become increasingly important in recent years. This is due to the deterioration of the general environmental situation, reduced quality of life, the emergence of chronic and widespread diseases.

More and more doctors and nutritionists are of the opinion that nutrition itself can prevent many types of diseases. Actually functional foods are able to perform the function of prevention of a significant number of diseases: diabetes, cardiovascular changes, oncology, atherosclerosis and more.

Chocolate is a class of food, mainly confectionery, made using cocoa beans.

Chocolate mass is prepared from grated cocoa, powdered sugar, cocoa butter, with the addition of flavorings. Many types of chocolate mass include other substances that improve the organoleptic properties, composition and nutritional value of chocolate: roasted and crushed nuts, milk and cream powder, condensed milk, raisins, phospholipids, sesame seeds, glucose, crushed waffles, cognac, liqueur, etc.

The main raw materials for the production of chocolate and chocolate products are cocoa beans. Cocoa beans are the seeds of the tropical cocoa tree Theobroma cacao L. from the Greek theos - god, broma - food, cacao - a distorted Mexican name for the seeds of this plant. The main amount of cocoa beans is produced in West Africa, South and Central America, less - in Asia and Oceania.

According to international standards, cocoa beans must be mature, full, round and healthy; the proportion of impurities in the batch of cocoa beans should not exceed 5%, moisture - no more than