**Тема:**  «Новейшие разработки в электротехнике. Сверхпроводимость»

**Цель:** Повторить грамматический материал , продолжить изучать лексическую тему «история науки».

**Задачи:** Отработать навык работы (в т.ч. перевода) с профессиональной лексикой по теме «электричество», повторить тематический материал, актуализировать имеющиеся знания.

**Специальность:** 13.02.09 Монтаж эксплуатации линий электропередачи, 13.02.11 Техническая эксплуатация и обслуживание электрического и электромеханического оборудования (по отраслям)

**Время выполнения:** 90 минут

1. **Study the new words.**
2. **Read the text.**
3. **Do the tasks.**

**High temperature superconductivity**

The phenomenon of superconductivity was discovered in 1911 by the Dutch physicist and chemist Heike Kamerling-Onnes. Initially, superconductors were of very limited use, since their operating temperature was not to exceed 20K (-253°C*). The superconducting state, in which the electrical resistance of a substance is zero, is destroyed if the temperature is above the so-called critical one.*

For example, a liquid helium temperature of 4.2K (-268.8°C) is well suited for the operation of a superconductor, but cooling and maintaining such a low temperature requires a lot of energy, which is technically very problematic.

In April 1986, the journal of the physical society "Zeitschrift fur Physik" received an article by the Swiss scientists Gerog Bednorz and Carlos Müller, which reported the discovery of a new class of superconductors - ceramics from lanthanum, barium, copper and oxygen. This work relatively quickly grabbed the attention of physicists and chemists from many laboratories around the world.

*Prior to this discovery, the maximum value of the critical temperature was 23.2 K.* This record belonged to the NbaGe compound (niobium-titanium alloy) and was achieved in 1973. (Historically, the first superconductor was mercury, for which the critical temperature is approximately 4 K.) The high-temperature superconductors discovered by Müller and Bednorz showed a much higher critical temperature, and liquid nitrogen temperatures of 75K (-198°C) are sufficient for such conductors to operate. In addition, nitrogen is much cheaper than helium as a refrigerant (coolant).

*The discovery in 1987 of a "jump in conductivity almost to zero" at a temperature of 36K (-237°C) in compounds of lanthanum, strontium, copper and oxygen (La-Sr-Cu-O) was the beginning.* Then, for the first time, the property of a yttrium, barium, copper and oxygen (Y-Ba-Cu-O) compound of was discovered to exhibit superconducting properties at a temperature of 77.4 K (-195.6 ° C), exceeding the boiling point of liquid nitrogen.

In 2003, a ceramic compound Hg-Ba-Ca-Cu-O(F) was discovered, which has a critical temperature of 138K (-135°C) and reaches 166K (-107°C) at a pressure of 400 kbar, and in 2015 it was set a new record for hydrogen sulfide (H2S), which became a superconductor at a pressure of 100 GPa, at a temperature not exceeding 203K (-70°C)

*In practice, high-temperature superconductors provide lossless transmission of electricity, which makes their introduction and use in the future highly efficient.*

Imagine that the current flows via wires, motor windings, power lines with almost no loss. But today, up to 40% of electricity is spent on "heating" the atmosphere. There are already projects for superconducting inductive energy storage devices to create storage capacities on a scale of power systems. Cryogenic power lines for direct and alternating current are being developed. *Cryogenic magnetic systems can be used in high-speed magnet axle transport and in many other areas of science and technology.*

Power cables, transformers, electrical machines, inductive energy storage devices with an unlimited storage life, current limiters, etc. - high-temperature superconductors are applicable everywhere in electrical engineering.

1. **Translate the lines given in italics into Russian.**
2. **Find equivalents for the followings:**
3. Функционал сверхпроводника
4. Привлекла внимание
5. Лимит температуры
6. В качестве хладагента
7. Свойство
8. Энергосистемы
9. **Fill in the gaps with the followings, then give a good translation to the text:** critical; resistance; available; low; temperatures.

**What is Superconductor? -** A material that can conduct electricity without (1) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_is known as a superconductor. In most of the cases, in some materials like compounds otherwise metallic elements offers some amount of resistance at room temperature, although they offer (2)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ resistance at a [temperature](https://www.elprocus.com/temperature-sensors-applications/) is called its critical temperature. The electrons flow from atom to atom is frequently done using certain materials once attaining the (3)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_temperature, therefore the material can be called superconductive material. These are employed in numerous fields like magnetic resonance imaging & medical science. Most of the materials (4)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_in the market are not superconductive. So they must be in a very low energy state to turn into superconductive. Current research is focusing on compounds development to develop into superconductive at high (5)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. **Match the term with it’s definition:**

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| Infinite Conductivity/ Zero Electric Resistance | 1. This temperature is also known as critical temperature. When the critical temperature of a superconducting material is changing the conducting state from normal to superconducting. |
| Meissner Effect | 1. If the two superconductors are divided with the help of thin-film in insulating material, then it forms a junction of low resistance to found the electrons with copper pair. It can tunnel from one surface of the junction to the other surface. |
| Transition Temperature | 1. If a superconductor ring is arranged in a magnetic field above its critical temperature, at the present cool the superconductor ring under its critical temperature. If we eliminate this field, then the flow of current can be induced within the ring because of its self-inductance. From Lenz law, the induced current opposes the change within flux that flows through the ring. |
| Josephson Current | 1. When the material is cooled under its transition temperature, then its resistance will be reduced to zero suddenly. For instance, Mercury shows zero resistance under 4k. |
| Critical Current | 1. When a superconductor is cooled under the critical temperature, then it doesn’t permit the magnetic field to go through in it. |
| Persistent Currents | 1. When the current supplied through a [conductor](https://www.elprocus.com/electrical-conductor-types-and-its-properties/) under the condition of superconducting, then a magnetic field can be developed. If the current flow increases beyond a certain rate then the magnetic field can be enhanced, which is equivalent to the critical value of the conductor at which this returns to its usual condition. |

1. **Listening comprehension. Fill in the gaps, answer the question.**

At present electricity is carried mainly by copper wire\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ however these have only a limited current carrying capacity - a great disadvantage when seeking to limit power losses. High-temperature\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on the other hand can carry much more current and lose hardly any power. Power cables made of superconductors have the potential to revolutionize power \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in areas of high population density and to simplify the integration of renewable energies. BASF is working on efficient and cost-effective production processes for superconducting\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and can enable the upscaling and mass production of buffer superconducting and protective layers. BASF we create chemistry.

[**https://www.youtube.com/watch?v=HKE8GsVres8&ab\_channel=BASF**](https://www.youtube.com/watch?v=HKE8GsVres8&ab_channel=BASF)

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