**ТЕМА: 2.3.4. ИННОВАЦИИ В ОБЛАСТИ МАТЕРИАЛОВЕДЕНИЯ И СТРОИТЕЛЬСТВА**

**ADVANCES AND INNOVATIONS IN MATERIALS SCIENCE AND ENGINEERING**

***1.Match the word combinations to their Russian equivalents***.

1) stimuli-responsive materials
2) seismic protection
3) intrinsic self-sensing property
4) high-end construction project
5) flexural strength
6) biodegradable material
7) piezoelectric material
8) shape-memory alloy

a) естественное свойство самостоятельно определять (например, нагрузку)
b) биоразлагаемый материал
c) проекты высокой сложности
d) прочность при изгибе
e) сейсмозащита
f) сплав с памятью формы
g) стимул-чувствительные материалы
h) пьезоэлектрический материал

***2.Read the text and give it a title.***

Advances and innovations in materials science and engineering have always played a substantial role in civil engineering, building structural design, and construction. In recent years, extensive effort has been devoted to the applications of stimuli-responsive smart materials in buildings. These smart materials used in the built environment can be defined as those having a unique active property that allows them to respond to changes in their condition or the environment that surrounds them. This means that one of their features may be changed due to such external conditions as alterations in mechanical strain, electrical or magnetic fields, temperature, moisture, pH and light. The change is usually reversible and can be repeated any number of time. Their unique properties make them a crucial material in many fields of engineering and science. They are also widely used in civil engineering projects and contribute in increasing performance, comfortability, and energy efficiency of structure. The most common types of smart materials used in building construction are:

*Shape-memory alloys (SMA)*

These materials have a shape memory function. It meant that they possess the ability to regain to some previously defined shape or size when subjected to appropriate thermal changes. The most common use of SMAs is found in die seismic protection of buildings because these materials can absorb repeated strains of energy without suffering permanent deformation or damage.

*Carbon fiber re info reed concrete (CFRC)*

As for brittle materials in general, concrete is strong under compression and weak under tension or flexure. This problem may be alleviated by adding of short carbon fibers. Carbon fiber itself is a high strength, high modulus material with good electrical conductivity. Adding the right amount of carbon fiber to concrete can give it intrinsic self-sensing properties and drive function. The strength and toughness of the concrete in this case is significantly improved. Highly resistant to bending, its great flexural strength means it can withstand significant transformations without breaking.

*Aerogel*

“Air glass” or Aerogel is a transparent material that looks like glass, insulates better than mineral wool and is more heat resistant than aluminium. The material is a flexible blanket insulation that can reduce energy loss whilst conserving interior space in residential and commercial building applications. It’s typically applied for complete coverage in walls, floors and roofs as well as in framing and windows to provide maximum energy efficiency. Aerogel can also be molded.

*Piezoelectric materials*

These materials can be divided into single-phase piezoelectric materials, piezoelectric composites and inorganic piezoelectric materials. The main principle of operation is the piezoelectric effect. This means that such materials are capable of producing electric current when subjected to mechanical stress

and vice versa. This property allows opportunities for implementing renewable and sustainable energy through power harvesting and self-sustained smart sensing in buildings.

***3. Work in pairs. Complete the table using the information from the text from ex. 26.***

| Term definition | Main characteristics | Advantages | Disadvantages | Applications |
|---|---|---|---|---|
| | | | | |

***4. A. Make up a short oral presentation (3-5 minutes) on a famous building constructed using smart materials. Use the information from the unit, Internet sites and reference books.***

***B. Present your work to your groupmates using the statements.***

- I'm going to talk about / tell you about....
- It's my view that....
- It seems clear that....
- Let's look now at....
- We can see that....
- I've discussed....
- I'm happy to answer any question you may have.
- Thank you for your attention.