

## ANNOTATION

1. Name of discipline **Technology of cement**
2. Direction (speciality) **18.04.01 "Chemical technology"**
3. Specialization program **Chemical technology of refractory nonmetallic and silicate materials"**
4. Qualification (degree) **magister**
5. Providing division - **Department of technology of silicates and nanomaterials**
6. Lecturer **Lotov V. A.**, tel: **563-169** E-mail: **valotov@tpu.ru**
7. **The learning outcomes of the module (discipline)**

1. To apply the theoretical knowledge in the field of physics and chemistry of refractory nonmetallic and silicate materials in the study and development of technological processes of creation of highly effective materials and ceramics, binders, glass, ceramics and composites on their basis;

2. Independently perform calculations of basic characteristics of the technological process of production of cement, choose a rational scheme of production of a given product, evaluate the production efficiency

3. To apply the experimental methods of determining physico-chemical properties of refractory nonmetallic and silicate materials and parameters of the reactions for their synthesis

### **8. The content of module (discipline)**

#### **Introduction.**

**Module 1.** The subject and content of the course "Technology of cement". Objectives of the discipline and its relationship with other disciplines of chemical-technological profile. Technological schemes and production methods of cement. Their technical and economic efficiency.

**Module 2.** Raw materials, technology of cement. Carbonate, clay raw materials and corrective supplements. Technical requirements raw materials. Chemical composition and physical properties of raw materials.

**Module 3.** Characteristics of Portland cement clinker. Chemical, and mineralogical composition of clinker and its modular characteristics. The physico-chemical system in the clinker.

**Module 4.** Physico-chemical processes for the preparation of the raw material mixture. The theoretical basis of the calculation of the raw mix. The reaction the ability of the raw mixtures and their technological properties.

**Module 5.** Theoretical basis of the process of firing the raw mix and the technological process of production of clinker. Performance and the capacity of the rotary kiln. The processes of heat transfer in the furnace. The technological zone of the furnace and characteristics of the processes occurring in these areas.

**Module 6.** The phase composition of the clinker and the properties of the individual phases. Polymorphism of clinker minerals. Temperature limit existence modifications of the minerals. Stabilization of minerals. Effect trace on the process of mineral formation.

**Module 7.** Regularities of the processes of clinker and obtaining cements. The formation of the granulometric composition of cements. Improving the efficiency of grinding. clinker. The mechanism of destruction of solids.

**Module 8.** Hydration and hardening of cement. The mechanism of the processes and the speed of their flow. The effect of temperature. Thermodynamics of hydration processes and hardening of cement. Physical the structure and strength of cement stone. Methods of structure control cement stone. Energy and physico-chemical effects on the system cement-water. Methods of research of processes of hydration and hardening of the cement.

**Module 9.** Construction and technical properties of cement. Requirements GOST for cement and standard test methods.

**Module 10.** Corrosion of cement stone and concrete. The concept aggressive environments. Chemical and physical processes in cement stone in terms of exposure to different aggressive environments. Resistance of cement stone in neutral, acidic and alkaline environment. Sulfate, carbonate and magnesium corrosion. Protection of concrete from corrosion.

**Module 11.** Varieties of cements. High strength and rapid-hardening cements. The road cement, cementing and pozzolanic cements. Portland slag cement and decorative cements. The features of the technology and application of cements.

**Module 12.** Aluminous cement. Raw materials and the technology of production. Phase and mineralogical composition of clinker. The mechanism of hydration and hardening of aluminous cement. The application of cement. Varieties of aluminous cement. Expanding and stressing cements. Technology and properties of sulfated clinkers. The mechanism of hydration of cements based on them.

**Module 13.** The main directions of intensification of production of cement. Process control in cement production. New ways of producing clinker. Improving the efficiency of use of cement. The properties of cement.

9. Course 2 semester 3 number of credits 4

10. Type of assessment (examination, credit) - credit

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