hyperfine interaction of the magnesium nuclear spin with electron spin changes the spin multiplicity of the pair and, as a result, affects the rate constants of enzymatic reaction [3].

Antibiotic resistance is one of the basic physiological properties of bacteria which turned out to be magnetically sensitive [4]. The combined effect of antibiotics and magnesium isotopes leads to changing antibacterial drug efficiency. The observed effects depend on the target of antibiotic action and nuclear magnetic moment presence of magnesium. The aim of this work is to use magnesium isotopes to strengthen quinolone antibiotics. Quinolones act by converting their targets, gyrase and topoisomerase IV, into toxic enzymes that fragment the bacterial chromosome.

The combined effect of most antibiotics from the quinolones group and magnesium isotopes on the growth and morphology of bacteria *E. coli* and *B. subtilis* was studied. Experimental data have been obtained demonstrating the increased bacteria sensitivity to some quinolones antibiotics in the presence of magnetic magnesium isotope. For example, the minimum inhibitory concentration for ciprofloxacin was less when ^{25}Mg was added to the nutrient medium. The mechanisms of magnetic isotopic effects of ^{25}Mg are discussed: its effect on the enzymatic activity of Mg-dependent enzymes involved in protection of the cells from the action of antibiotics. The method for potentiating ciprofloxacin using a magnetic isotope of magnesium is proposed.

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SYNTHESIS OF COMPLEX OXIDE COMPOSITIONS FOR URANIUM-THORIUM NUCLEAR FUEL IN TORCH PLASMA DISCHARGE

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Today, a significant part of nuclear energy is produced by nuclear power plants using ceramic nuclear fuel from uranium dioxide enriched in the uranium-235 isotope. Such fuel has a number of disadvantages, among which it is low thermal conductivity and the need for expensive isotope enrichment.

At the same time, a promising direction for the further development of nuclear energy is the tendency to create dispersion nuclear fuel, which is a nuclear fuel composition in which the fissile phase is in the form of particles (metal, compound) uniformly distributed in a matrix of non-fissile material. Such fuel has good mechanical properties, and the matrix material determines the radiation resistance and high thermal conductivity of the fuel [1].

The main technologies for producing oxide compositions for dispersion nuclear fuel are: thermal decomposition, reduction of oxides, electrolytic production from molten salts, sol-gel process. Common disadvantages of these technologies are: multi-staging, high cost of processing raw materials, uneven distribution of phases in the product, the need to use a large number of chemicals.

At the same time, the technology for the synthesis of oxide compositions in air plasma has the following advantages: one-staging, homogeneous phase distribution with a given stoichiometric composition, the ability to actively influence the particle size and morphology [2,3].

It should be noted that the processing of nitric acid solutions in plasma is quite expensive. To reduce energy consumption, an organic component is added to the composition of the solutions, which, oxidizing in the air plasma, adds additional energy, allowing to increase the consumption of the processed solution and, thus, increase the yield of the target product.

The work was carried out thermodynamic modeling of the process of plasma-chemical synthesis of complex oxide compositions from water-organic nitrate solutions (WONS), consisting of fissile material and matrix material. Uranium and thorium oxides were considered as fissile inclusions, magnesium oxide was used as the matrix material, acetone was used as an organic additive.

As a result of the simulation, the optimal WONS compositions based on uranyl, thorium and magnesium nitrates, as well as acetone, were calculated. The optimal modes of WONS plasma treatment were determined as well. The results of the studies can be used to calculate the plasma chemical synthesis of complex oxide compositions for dispersion nuclear fuel.

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PLASMA IMMOBILIZATION OF SILTS IN STORAGE POOLS WITH LOW RADIOACTIVE WASTE

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During exploitation of equipment at nuclear fuel cycle (NFC) plants a lot of liquid radioactive wastes (LRW) were accumulated and located at the bottom in storage pools. They consist of Fe (3–17 %), Si (2.8–8.5 %), Ca (0.2–3.2 %), Mg (1–2.8 %), Na (0.7–1.9 %), P (0.1–0.9 %), etc. [1].

Different recycling methods such as sorption, electrochemical, chemical are known [2]. To stabilize and convert silts into sustained forms preventing migration of radionuclides from wastes different methods involving