Gaussian software package (GaussView 3.0; Gaussian 09 W). The calculation was carried out at the temperatures of 753 K (480 °C) and 793 K (520 °C) and at a pressure of 14 atm (1.4 MPa). After calculation, the total number of thermodynamically possible reactions ($\Delta G < 0$) was reduced to 305.

The research has contributed to the development of formalized scheme of substances transformations in the catalytic reforming process. The scheme includes 55 components (40 individual and 15 pseudo-components) and 305 thermodynamically possible reactions.

The selected high detail level will ensure the high sensitivity of the mathematical model to changes in the composition of raw materials and high accuracy of calculations.

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GRAMICIDIN S COMPOSITION WITH SURFACTANTS FOR LIQUID DRUG FORMULATION

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New antibiotics investigation has been the subject of recent years fundamental and applied research in the ever-growing resistance of microorganisms towards antimicrobial agents [1]. Despite all the efforts recent WHO report demonstrates that the threat of antimicrobial resistance is always increasing in current conditions [2].

Gramicidin S is a natural peptide which exhibits strong antibiotic activity towards Gram-negative and Gram-positive bacteria and several pathogenic fungi as well interacting with the cell-membranes to make the canals for ion-erosion [3].

However, due to low solubility Gramicidin S formulation is generally fabricated in solid state dosage form [4].

In the present work, Gramicidin S was solubilized forming the microemulsion based on tween-80 as surfactant since it has the appropriate properties for peptide solubilization as determined previously [5].

The main aim was to form a stable Gramicidin S composition that saves its antimicrobial activity and demonstrates no more side-effects comparing to tablets.

The resulting emulsion showed poor stability and lost its homogeneity in several months which resulted in phase separation.

Next step was to add co-surfactant in order to stabilize tween-80 loaded with gramicidin S in water with propylene glycol used as a co-surfactant.

The obtained emulsion demonstrated enhanced stability being stored under room temperature.

Also the antimicrobial properties were enhanced comparing to ethanoic solution of gramicidin S that can be described by the presence of surfactants in ready formulation [6].

Forward studies let us find the optimal rate of the components in the microemulsion obtained that provides the system stability for the longest time.

The structure of the resulting composition was characterized using DLS and SEM methods which have proved the stable emulsion formation.

As a result gramicidin S loaded in tween-80 microemulsion can be regarded as promising composition for liquid drug formulation of the peptide for oral and topical application.

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TECHNOLOGICAL PROCESSES OF URANIUM EXTRACTION

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Mining and processing of uranium raw materials are essential for the nuclear industry. In current time uranium is mined by in situ leaching. A leaching agent is pumped through the well, and a productive solution containing uranium comes to the surface. Due to low concentration of uranium in obtained solutions, a concentration stage is carried out for complete extraction.

Nowadays, sorption is the main industrial method of concentrating uranium. Desorbates are precipitated, and then calcined to uranium oxide (U_3O_8). The resulting uranium concentrate should be easily filtered, dried, and should not contain significant impurities. The content of neutron-active impurities such as boron, cadmium, rare earth elements (REE), as well as iron, vanadium, silicon, etc. should be monitored especially carefully.

Hydrogen peroxide, ammonium or sodium hydroxides are commonly used as precipitants. Significant disadvantages of peroxide deposition are low filterability of sediments, the production of coarse-grained powders unsuitable for fluoridation and pressing in the manufacture of nuclear fuel elements cores [1]. In addition, U_3O_8 formed during calcination after peroxide deposition is almost chemically inert and does not meet the requirements of nuclear purity, as a result of which additional purification is necessary. Accordingly, a possibility of change over from direct deposition of uranium to extraction is considered. The advantages of the extraction method over the precipitation method are its selectivity, quickness of the process and the possibility of obtaining high separation factors.

The most common extraction refining of uranium from nitric acid solutions with use of tributyl phosphate $(C_4H_9)_3PO_4$ as an extractant. Thus, the desorption of uranium with ammonium nitrate allows using TBP or its synergetic mixtures with amines as an extractant [2].

As part of this work, uranium oxide was obtained in three different ways of sedimentation: peroxide, ammonium and extraction. Peroxide precipitation was carried out using a 30% H_2O_2 solution at pH ranging from 0.5 to 3.5. The reaction is described by the following equation:

$$UO_2(NO_3)_2 + H_2O_2 + xH2O = \\ = UO_4 \cdot xH_2O\downarrow + 2HNO_3 \qquad (1)$$

Boron and REE impurities are well separated, but in addition to uranium Fe, P, Al and V are deposited. That is unacceptable, as long as a large amount of impurities destroys hydrogen peroxide and interfere with the deposition of uranium.

A 25% NH_4OH solution was used for ammonium deposition:

$$4UO_2(NO_3)_2 + 10NH_4OH = \\ = (NH_4)_2U_4O_{13}\downarrow + 8NH_4NO_3 + 5H_2O \qquad (2)$$

Quantitative precipitation of uranium begins at pH = 6–7, phosphorus, vanadium and partially REE are also precipitated.

During extraction precipitation, uranium was first extracted with 30% TBP solution in rubber solvent. At this stage, the majority of impurities are separated, because TBP mainly extracts nitrates, which are able to associate into molecules (nitrates U(VI), Pu(VI), and partly Zr and Hf). Solid phase reextraction, similar to the process of ammonium deposition, was carried out: