Table 1. Thermodynamic parameters of process reactions (at 520 °C, 1.2 MPa)

Reactions	ΔH, kJ/mol	ΔG, kJ/mol
2 Paraffins C_1–C_2 → Paraffins C_3–C_5 + $2H_2$	184.45	–28.0
Paraffins C_3–C_5 → Olefins + Paraffins C_1–C_2	69.52	–27.0
Paraffins C_3–C_5 → Aromatic HC (C_6–C_{12}) + $4H_2$ + Paraffins C_1–C_2	274.15	–65.0
6 Olefins → Aromatic HC + (2–3)H_2	–248.0	–101.0
Aromatic HC → Polyaromatic HC	–94.84	–291.6
Polyaromatic HC → Coronen + H_2	–87.3	–97.5

Table 2. Reaction rate equations

Direct reaction	Reverse reaction
$W_1 = k_1 \cdot C^2_{paraffins\ C1–C2}$	$W_{-1} = k_7 \cdot C^2_{H_2} \cdot C_{paraffins\ C3–C5}$
$W_2 = k_2 \cdot C_{paraffins\ C3–C5}$	$W_{-2} = k_8 \cdot C_{olefins} \cdot C_{paraffins\ C1–C2}$
$W_3 = k_3 \cdot C_{paraffins\ C3–C5}$	$W_{-3} = k_9 \cdot C_{polyaromatic\ HC} \cdot C_{H_2} \cdot C_{paraffins\ C1–C2}$
$W_4 = k_4 \cdot C^4_{olefins}$	$W_{-4} = k_{10} \cdot C_{aromatic\ HC} \cdot C_{H_2}$
$W_5 = k_5 \cdot C_{aromatic\ HC}$	$W_{-5} = k_{11} \cdot C_{polyaromatic\ HC}$
$W_6 = k_6 \cdot C_{polyaromatic\ HC}$	

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CHITOSAN-BASED FILMS FOR GRAMICIDIN S SUSTAINED RELEASE

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Due to permanent antibiotic resistance development, antimicrobial peptides became attractive candidates for drug development [1].

Among those, Soviet invention – Gramicidin S represents strong antibacterial properties, which reflects in low inhibitory and bactericidal concentrations, and a specific mechanism [2].

Since the peptide is toxic towards to the red blood cells, its application is limited to the topical level [3].

Gramicidin S is used in a complex therapy of eye infections as an active ingredient of eye drops which demand a periodical application of several drops 2–3 times per day [4].

As an alternative dosage form and in order to decrease the application periodicity the film formation was proposed which had previously been tested on the short-life anesthetics [5].

The aim of this work was to develop a composition of a film based on chitosan containing Gramicidin S, which would provide a sustained release of the drug in the eye media

During the composition development different polyanion excipients were incorporated into the film to provide optimal mechanical properties, and the plasticizer content was determined.

Also different conditions for the active ingredient impregnation into the film were studied revealing that adding the emulsion containing Gramicidin S made the resulting film more transparent and homogeneous while adding the antibiotic suspension led to faster drying time.

The films were characterized by FT-IR, total soluble mass, water vapor permeability, swelling measurements and surface pH evaluation.

In vitro release studies were performed in the pH of eye media (7.4) at 37 °C. The drug concentration in buffer solution was detected using HPLC method.

The resulting film was totally biodegradable providing a certain benefit to the perspective drug formulation excluding the demand to exchange or remove the film after a certain time of application.

At the same time the release study demonstrated that the dosage regime of Gramicidin S correlates with the same parameter of the eye drops formulation.

The obtained result allows to develop a new Gramicidin S formulation for local application in eye with single administration per day.

In order to prove that the antimicrobial activity remains the same, the comparative antimicrobial test was performed according to the Russian Pharmacopeia monograph procedure against gram-positive bacteria *S. Aureus* and and funghi *C. Albicans* [6].

The stability of a ready composition had been studied for 1 year and continues.

As a result, the alternative Gramicidin S dosage form was developed. The film represent good stability, comparable antimicrobial activity and needs lower frequency of administration comparing to eye drops.

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DETERMINATION OF VANILLIN IN SMOKING MIXTURES BY SPECTROPHOTOMETRY

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Synthetic 4-hydroxy-3-methoxybenzaldehyde (vanillin) is used as a flavoring agent in perfumery, the food industry, as a flavoring agent for sweet products and in pharmaceuticals. The smoking mixtures contained in hookahs and various electronic cigarettes are freely available and are not controlled for the content of harmful substances.

Vanillin is able to accumulate in the human body and be toxic in high concentrations (oral, rat: LD50 – lethal dose) (LD50 = 2 $g \cdot kg^{-1}$; oral, guinea pig: LD50 = 1.4 $g \cdot kg^{-1}$; intravenous, dog: LD50 = 1.32 $g \cdot kg^{-1}$; inhalation, mouse: LC = 41.7 $g \cdot kg^{-1}$) [1]. Thus, the development of a method for determining vanillin is justified.

The aim of this work was to determine vanillin in smoking mixtures by spectrophotometric method.