POLAROGRAPHIC DETERMINATION OF NICOTINE, IN THE FORM OF N-OXIDE, IN SPRAY «NICORETTE»

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Nicotine (3-(2S)-1-methylpyrrolidin-2-yl)-pyridine) – one of the representative of the alkaloids of the pyridine series. It is contained in the leaves and stems of tobacco and other members of the nightshade family of plants and in cigarettes, cigars and refills for electronic cigarettes. Nicotine acts on the central nervous system, makes a person feel more relaxed. This effect is one of the features desired by smokers, which leads to their regular use of tobacco products containing nicotine. As a substance, nicotine is toxic and causes paralysis of the nervous system. Prolonged use of nicotine leads to hyperglycemia, hypertension, tachycardia, heart failure and myocardial infarction. It should be noted that nicotine as a substance does not cause cancer, but accelerates the growth and migration of existing cancer cells and promotes the transformation of some precancerous cells into cancer.

In the human body, nicotine is converted into metabolites. The main metabolites of nicotine are cotinine and nicotine N-oxide. Therefore, the development of methods for the determination of the alkaloid – nicotine in the form of its metabolite is actual. Previously we have reported the work on voltammetric determination of alkaloid – nefopam based on the obtaining of polarographically active derivatives – N-oxide [1]. We used the same approach for nicotine.

We have developed a technique based on two reactions: chemical – obtaining N-nicotine oxide using potassium peroxymonosulfate (KPMS) (Fig. 1.) and electrochemical – reduction of N-nicotine oxide on DME. We investigated the effect of various factors on the quantitative yield of N-oxide (pH, time and temperature of oxidation, reagent concentration), on the reduction of N-oxide in DME.

We have found that the highest yield of nicotine N-oxide at oxidation pH is pH = 9.3 in Britton-Robinson buffer solution (BR) at a temperature of 40 ^{o}C for 10 minute and it was desirable that the concentration of KPMS did not exceed 10^{-4} L·mol^{-1}, because higher KPMS concentrations lead to amplification and fluctuations of the background current. The shape of polarograms, current and nicotine reduction potential depend on the pH of the solution. Peak potentials were shifted in the negative direction with increasing pH. The highest current of reduction of N-oxide of nicotine was reached at pH 4.5, so for further research we chose pH 4.5.

Under these conditions, analytical parameters were determined. Linear the dependence of the reduction current of nicotine N-oxide on the concentration obtained in the range from $2{\cdot}10^{-6}$ L·mol^{-1} up to $4.0{\cdot}10^{-5}$ L·mol^{-1}. The detection limit is $1.4{\cdot}10^{-6}$ L·mol^{-1}, the quantitative limit is $4.2{\cdot}10^{-6}$ L·mol^{-1} and the correlation coefficient is 0.9979.The developed method was applied for the analysis of commercial drug oral spray "Nicorette" with recovery of 101.5 %.

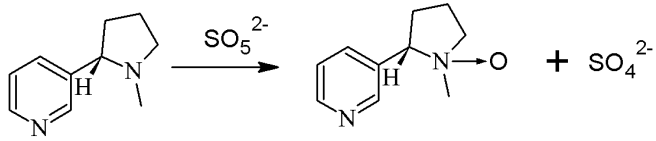

Fig. 1. Equation of the reaction of obtaining nicotine N-oxide by potassium peroxymonosulfate

1. Dubenska L., Dushna O., Pysarevska S., Blazheyevskiy M. A new approach for voltammetric determination of nefopam and its metabolite. *Electroanalysis*. 2020. Vol. 32, No 3. P. 626–634. DOI: https://doi.org/10.1002/elan.201900595