

A COMPLEX OF SAFETY MEASURES AT WORK IN THE LABORATORY OF ORGANIC SYNTHESIS

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Abstract. The main factors of danger when working in the laboratory of organic synthesis are considered and systematized. Practical recommendations on preventing dangerous situations and maintaining health while working in the laboratory of organic synthesis are provided.

Keywords: organic synthesis, work in the laboratory, security.

Анотація. Розглянуто і систематизовано основні чинники небезпеки при роботі в лабораторії органічного синтезу. Надано практичні рекомендації щодо запобігання небезпечних ситуацій і збереження стану здоров'я під час роботи в лабораторії органічного синтезу.

Ключові слова: органічний синтез, робота в лабораторії, комплекси безпеки.

Introduction. The active development of the chemical industry is leading to the expansion of the number of laboratories. With an increase in the number of laboratories, the appropriate number of qualified personnel should be available. The laboratory of organic synthesis requires careful and careful work, as organic substances can be flammable, toxic, explosive. When using special equipment, you should be careful and adhere to the laboratory's rules of operation. Ignoring this, possible damage of technique, occurrence of burning substances, poisoning, burns. It is expedient to reduce the amount of substances with which work is carried out.

Analysis of the state of the issue. The number of accidents occurring at the enterprises that are specific on organic synthesis makes to think about the expediency of paying attention to the strict implementation of safety control points in the laboratory. Organic synthesis is an industry of chemical synthesis that specializes in the reception of various molecules, often more complex, which requires the use of various reagents, which are not always safe and stable.

Also attention requires understanding in chemistry of processes and peculiarities of reagents which are applied at execution of synthesis. In addition, a lot of attention should be paid to the order in the chemical laboratory and the convenient location of the first-aid kit and fire extinguisher. It will not be superfluous to mention the necessity to avoid breathing of steam, smell, the purchase of any substances which are in the territory of the laboratory.

Purpose: to develop a set of safety measures at work in the laboratory of organic synthesis, which are aimed at increasing the knowledge of chemists working in the laboratory, also to reduce the negative impact on the person and environment.

Methods, materials and research results. Organic synthesis is one of branch of chemistry, which investigates different methods, methods, develops new equipment for obtaining organic compounds and materials and also the process of their reception. Many compounds are obtained in laboratory conditions.

Work in the laboratory requires, first of all, collective work, it is forbidden to work alone [1].

Before you start the process, you should carefully study the properties of substances that will be used (for example, boiling point, whether in compounds of pyro properties, toxicity, aggressiveness). Data on properties can be obtained directly from the bulk of the reagent container, according to the GHS (Globally Harmonized System of Classification and Labeling of Chemicals) each potentially hazardous substance must contain the appropriate marking with information about it. If there is no marking or marking on the can, it is strictly forbidden to work with such substances.

When working and using acids, alkali, anhydride acids, amins, alkylating agent, arilator agent need to carefully pour/carry these solutions trying not to breathe in the steam that can bypass the mucus of the respiratory tract. The same recommendations can also be applied to work with solvents (most of them have unpleasant smell and can be toxic) [2].

Special attention should be paid to work with metallic substances (Grignard reagent, organolithium compounds, hydrides reducing agent – LiAlH_4 , NaBH_4 , NaH ,) i Pd/C- all these substances are capable of self-employment at wrong handling, namely: absence of argon environment in the reactor, insufficient dry solvents, dishes, gloves of chemist. When using these reagents, it is also dangerous to «quench» reaction mixtures with hydride reagents, since there is a large amount of hydrogen, which under certain conditions can swell, and also at too intensive addition of «quencher» (water, meadow, methanol) can be released reactionary mixture out.

I also want to note that if the unknown thermal effect of the reaction in advance, it is necessary to add reagents gradually, paying attention to the thermometer in the reactor, because it is possible such a situation, when on a small loader there was no significant heat release, and at scale the reaction turns out, which can lead to the release of the reaction mixture out.

Work with the distillation units, vacuum rotors is a separate danger, because the pressure is lower than atmospheric pressure, when using dishes of improper quality (cracks) you can get injuries from glass fragments. It is necessary to strictly observe the rules of dismantling of the distillation plants, since besides vacuum the separate danger is divided oxygen. Therefore, protective goggles in the laboratory should be used constantly, not only at the production of synthesis, but also at the stay near vacuum installations.

After receiving the target product, often there is a question about clearing it from impurities. Often apply colone liquid chromatography, the adsorbent of which is silica gel (SiO_2). Due to its small structure, it is possible to get into the lungs at breath, which can later lead to such a disease as silicose. Therefore, work with this material only under the pull-out and with the lowered freight.

The waste disposal of chemical production is a separate part. Because it is one of the most dangerous and toxic waste. Laboratory disposal involves separate collection of the plants after reactions, washing of dishes, dry waste and further burial. Reagents that can be re-generated (Pd, Ag) collected separately. It will not allow the release of chemical waste into the stream [3].

Conclusions. Summing up all the consideration, it is possible to say that the

attention and awareness of synthetic is the guarantee of safe work in the laboratory. Strict adherence to safety regulations prevents emergency situations.

A complex of security measures, provides for consideration of all possible dangerous situations and ways of their avoidance.

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