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FLUOROANTIMONIC ACID: LINGUISTIC RISKS AS AN ENVIRONMENTAL HAZARD FACTOR

Modern chemical technology faces a paradox: solving global environmental challenges, such as waste recycling or the creation of "green" energy sources, requires the development and implementation of increasingly complex and reactive substances. However, these same reactive compounds carry enormous danger potential. Fluoroantimonic acid ($HSbF_6$) is a prime example of such a substance that can become an engine of progress [1]. Recognized as one of the strongest superacids, it opens up new horizons in catalysis and organic synthesis, but at the same time it is a substance of exceptional corrosion activity and toxicity.

While the chemical aspects and potential applications of fluoroantimonic acid are covered quite widely in English-language scientific literature, the key problem for the Russian scientific and industrial community becomes not so much the substance itself, but the "human factor", aggravated by the language barrier. Working with international reagents and technical documentation, primarily Safety Data Sheets (SDS), requires accurate and unambiguous understanding of warnings. Inaccurate translation of critically important phrases can create an illusion of control and lead to errors, turning a local accident into a full-scale environmental disaster with long-term consequences for the environment and human health.

The purpose of this work is to analyze fluoroantimonic acid not only as an object of chemical technology, but also as a source of specific linguistic risks, and to develop on this basis a practical tool for improving safety.

Tasks:

1. To assess the environmental and technological risks of the substance.

2. To identify and analyze key English hazard terms in SDS.

3. To develop a thematic glossary-handbook for the correct translation of these terms.

Fluoroantimonic acid, obtained by the reaction of hydrogen fluoride (HF) and antimony pentafluoride (SbF_5), has a unique ability to protonate even extremely weak bases, making it an indispensable tool in modern chemical technological processes [2]. Its potential lies in the creation of highly effective catalysts for alkylation and isomerization processes in petrochemistry, as well as for the decomposition of persistent

polymer wastes. However, these outstanding chemical properties determine its extreme danger:

1) Toxicological: Acid vapors, when inhaled, cause severe burns of the respiratory tract, pulmonary edema and can be fatal.

2) Ecological: Acid spill leads to immediate and long-term acidification of soils and reservoirs. Fluorine and antimony ions are highly toxic pollutants that are stable in the environment.

3) Man-made: The substance reacts violently and explosively with water, which excludes the use of water to extinguish fires when working with acid and complicates the elimination of accidents. It corrodes glass and most structural materials, placing exceptional demands on storage and operating conditions.

The Safety Data Sheet (SDS) is the main document regulating the handling of a chemical. However, its effectiveness directly depends on the accuracy of the user's perception of information. The analysis of the provided SDS for fluoroantimonic acid [3] clearly demonstrates how there are formulations in the official document, whose inaccurate translation can lead to a fatal underestimation of the danger.

The substance we are considering releases extremely toxic products during decomposition or combustion. Such hidden risks are easily overlooked during a quick or inaccurate translation (see Table 1).

Table 1. Analysis of key terms from the SDS, their potentially dangerous translations and recommended correct analogues developed for unambiguous risk understanding.

English phrasing from SDS	SDS Section	Incorrect Translation	Why is it dangerous?	Correct Translation
Acute toxicity - Category 1, Dermal	2	Острая токсичность при контакте с кожей	Не передает, что это высшая категория смертельной опасности	Смертельно при контакте с кожей (Категория 1)
Causes severe skin burns and eye damage	2	Вызывает раздражение кожи и глаз	Кардинально приуменьшает тяжесть поражений. Слово «раздражение» не соответствует реальности — это химический ожог	Вызывает тяжелые ожоги кожи и глаз
H332 Harmful if inhaled	2	Вредно при вдыхании	Слово «вредно» размыто и не вызывает достаточной тревоги,	Токсично при вдыхании

			хотя мы знаем, что пары данного химического соединения при вдыхании могут привести к летальному исходу	
H411 Toxic to aquatic life with long lasting effects	2	Вредно для водных организмов	Не передает масштаб и долговременный характер экологического ущерба	Высокотоксично для водных экосистем, с необратимыми последствиями
Specific hazards: no data available (при наличии высшей категории токсичности)	5	Особые опасности: данные отсутствуют	Создает ложное ощущение безопасности.	Выделяет высокотоксичные пары. См. раздел 2 (Классификация опасности)

The practical significance of this analysis is confirmed by real cases from professional activities. For example, if an engineer, seeing the translation "вредно при вдыхании" (H332), decides that it is possible to briefly enter a gassed area without respiratory protection, this can lead to severe poisoning. The contradiction between "specific hazards: no data available" (section 5) and "acute toxicity - Category 1" (section 2) is particularly insidious and requires the specialist to compare information from different sections of the SDS, which is difficult to do with a language barrier.

Inaccuracies in the translation of SDS warnings create a "blind spot" in the industrial and environmental safety management system. Incorrect interpretation of the instructions for working with these chemical compounds can endanger chemical engineers, but also lead to industrial environmental disasters with long-term consequences. For example: the death of flora and fauna, damage to soils and reservoirs, the occurrence of acid rain, etc.

The conducted research allowed establishing that fluoroantimonic acid, being a promising object for the development of "green" chemical technologies, is a source of complex ecological and man-made risks. The key conclusion of the work is that the language barrier and inaccurate translation of English-language warnings in safety data sheets (SDS) are an independent and significant factor of environmental and man-made risk. Semantic inaccuracies form an inadequate perception of the degree of threat among staff, which can become a trigger for making erroneous decisions and developing an emergency situation with large-scale consequences for the environment.

Based on the analysis, the following practical recommendations are formulated:

1. For scientific and industrial enterprises: It is recommended to implement a brief glossary-handbook of critical safety terms, similar to the one presented in Table 1 of this article, into the training and instruction system for personnel working with imported reagents. This simple action will unify the understanding of hazards and improve the safety culture.

2. For educational institutions: It is advisable to include a module dedicated to working with international technical documentation, focusing on linguistic aspects and accurate interpretation of warnings, in the training programs for chemical technologists and environmental engineers.

In this way, the problem of safety when working with hazardous substances is related to the fact that it is important not only to be a good engineer, but also to understand the intricacies of the English language. Improving translation accuracy is not an academic task, but an effective accident prevention tool that helps preserve human and planetary health.

References:

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