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**SOME DIFFICULTIES OF GENERAL CHEMISTRY  
VOCABULARY TRANSLATION  
(FEATURING EXAMPLES OF GREEN CHEMISTRY TERMS)**

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The authors dwell on some common challenges that technical students face when translating texts on general chemistry – term homonymy, lack of new terms in technical dictionaries, use of multi-component terminological units and acronyms – and discuss ways of dealing with these challenges.

**Key words:** term homonymy, multi-component terms, acronyms, ‘translator’s false friends’.

Like terms of any other field of knowledge, general chemistry vocabulary items challenge translation for quite a number of reasons. This article deals with some difficulties of English-to-Russian translation which is commonly practiced by students of technical colleges since the students are bound to read English papers on science issues.

One of the factors impeding translation is term homonymy. On the one hand, homonymy is sometimes due to the fact that words of general stock assume a technical meaning, thus becoming terms: for instance: *waste* – «потеря, трата» and «отходы, сточные воды», *degradation* – «ухудшение, ослабление» and «деструкция, распад» (thus, many students find it difficult to translate the term *chemical degradation* as «химический распад»).

Another difficulty is that, even though terms are supposed to have one meaning in one field, one and the same term might belong to different domains having different meanings: *degradation* as «распад» in chemistry, and as «вырождение» in biology, for instance. And it goes without saying that a student is to be aware of ‘translator’s false friends’, that is words of two or more languages similar in form but different in meaning, for example: *benzene* in chemistry is equal to «бензол», not «бензин», the latter corresponding to *benzine, gasoline*, the term *degradation* can’t be translated as «деградация», the term *substance* («вещество») is not to be translated as «субстанция», etc.

So it is essential to see that a word is being used as a specialized term in a particular domain, then it will merely be a matter of consulting a terminology dictionary for that domain to find the standard translation of the term and referring to the corresponding standard science terminology in Russian.

However, one might face a problem of finding translations for terms that do not yet appear in the terminology database being used or yet lack adequate terminological translation. A very vivid example is the very term *green*

*chemistry*, which is often translated as «зеленая химия» in works of both academic and non-academic discourse (see for this: [1]). But this word combination gives no idea of the domain's subject matter and arouses misleading associations with the field of ecology or Green Peace activity. Besides, Russian scientific discourse is known to be more standardized and less emotional which makes collocations of this kind less acceptable. A possible translation, though not unanimously recognized, is «экологически безопасная химия» (see, for instance [2]; compare Zhu Yubin's suggestions about the interpretation of the term *green food* [3]).

To do accurate translation, it is necessary not only to know the meaning of the terms referring them to the right domain but also to link them with other words in speech. Erroneous interpretation of terminological word combinations can cause difficulties in understanding the text. The very structure of chemistry terms provides problems in translation.

Structurally general chemistry terms can be classified into one-word terms and word combinations (two-word terms, three-word terms).

One-word terms are a) simple words (or root-words), consisting of a root only (*hazard, cycle, etc.*), b) derived words, consisting of a root and an affix or several affixes (*consumer, recycling, chemical*), c) compound words, made up of more than one root (*feedstock, footprint, carcinogen*). Morphologically one-word terms are represented as nouns, verbs and adjectives with nouns prevailing.

Word combinations most typically fall into two-component word combinations and three-component word combinations.

Two-component word combinations may consist of: a) two nouns – N + N: *atom economy, research laboratory, energy consumption, life cycle, reaction rates, reaction temperatures, accident prevention, pollution prevention, risk reduction, climate crisis, synthesis methods, waste minimization, etc.*; b) an adjective and a noun – Adj. + N: *green chemistry, green chemist, organic chemist, chemical industry, natural resources, chemical process, toxic substances, hazardous waste, environmental pollution, renewable feedstocks, etc.*; c) a noun and an adjective – N + Adj.: *energy intensive*.

Three-component word combinations consist of: a) three nouns – N + N + N: *greenhouse gas emission*; b) an adjective adjoining the first noun) – Adj. + N + N: *green chemistry principles, green chemistry techniques, environmental pollution risk, real time analysis, lower temperature reaction, Green Chemistry Institute*; c) two adjectives and a noun – Adj. + Adj. + N: *synthetic chemical material, nonrenewable fossil fuel*; d) an adverb, an adjective and a noun – Adv. + Adj. + N: *environmentally friendly chemicals*; e) a preposition and two nouns (with the preposition adjoining the first noun) – Prep. + N + N: *in process control, in process monitoring*.

Occasionally among chemistry terms one may find four- or even five-component combinations (with the first element being an adjective in the latter case): *The Presidential Green Chemistry Challenge Award*.

One-word terms and multi-component terms of the Adj. + N and Adj. + Adj. + N types are not usually difficult to translate (but for the semantic challenges mentioned above) as they allow for word-for word translation ('literal translation') and are easily found in vocabulary databases: *natural resources* – природные ресурсы, *chemical process* – «химический процесс», *nonrenewable fossil fuel* – «невозобновляемое ископаемое топливо», etc.

As for the other structural types of general chemistry terms, one problem is that multi-component terms are not easily recognized by technical students as terminological units. So first of all some linguistic training is necessary to provide students with parsing skills and with tools for recognizing and using multi-components word-combinations.

Students need to get an idea that Russian one-word terms do not infrequently correspond to English two-word combinations and they also need to acquire skills of identifying English two-word combination of the types which are often rendered by one word in Russian. It takes certain effort, for instance, to see that *energy intensive* is a terminological unit (with the adjective coming after the noun, which is often confusing for Russian students). But if the right terminological combination is singled out from the text and run through dictionaries it is inevitably translated by students as «энергоемкий».

Students are to be taught to translate multi-component terms of the N + N, N + N + N, Adj. + N + N types and get the idea that to translate them into Russian accurately one must start with the last component, translating the term "backwards": *accident prevention* – «профилактика несчастных случаев», *environmental pollution risk* – «опасность загрязнения окружающей среды».

Besides, descriptive translation and expansion are often necessary and must be practiced by students. As a matter of fact, in English-to-Russian translation, a more explicit character of the Russian language often necessitates expansion: *in process control* – «контроль в процессе производства / обработки и т. п.», *real time analysis* – «анализ в режиме реального времени». For some noun phrases used in general chemistry and all its areas descriptive translation is indispensable: *The Presidential Green Chemistry Challenge Award* – «награда за достижения в области "зеленой химии", ежегодно вручаемая от имени президента США», *green chemists* – «химики – специалисты в области "зеленой (экологически безопасной) химии"».

A separate problem faced by chemical students is use of acronyms in the field of general chemistry (words created from the initial letters of a phrase or string of words) – ACS (*American Chemical Society*), EPA (*Environmental Protection Agency*), OECD (*Organization for Economic Cooperation and Development*) и т. п. Obviously, acronyms are to be explained in textbook notes.

This problem can also be resolved by consulting online resources, lists of commonly used acronyms (with the corresponding full names provided). The names are most often of the N + N + N... or Adj. + N + N... types and can be translated just like other types of chemical terms.

To sum up, while translating general chemistry terms one should take into account the specific character of the context to efficiently cope with term homonymy and provide stylistically accurate translation. It is essential to see the connections of words in the context to single out a terminological unit and when dealing with a multi-component term one has to pay special attention to its structure and also employ descriptive translation if necessary.

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