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Some New Chemical Terms Of Polymer And Analytical Chemistry And Their Definitions In Georgian

ABSTRACT

For the full functioning of a state language, it is essential to develop specialized, field-specific terminology in education and scientific disciplines. One of the major challenges of the 21-st century is the technologization of languages, which entails the creation of electronic terminology systems and comprehensive term banks. This work is continuous, as the rapid advancement of science, healthcare, engineering and technology, agriculture, and ecology constantly poses new challenges for chemical terminology. In this context, polymer and analytical chemistry are particularly noteworthy. Since the 1950s, these fields have expanded to such an extent that they now constitute independent and well-established branches of chemistry. To date, numerous new polymers have been synthesized, innovative methods for their preparation and modification have been developed, and their chemical, biological, physical, and technical properties have been extensively investigated. These developments frequently necessitate the introduction of new terms and precise definitions. A similar situation exists in analytical chemistry, where technological progress and the emergence of new or modernized physicochemical analytical methods have also required the continual expansion of terminology.

Polymer and analytical chemistry are also developing rapidly in Georgia, where both research activities and practical applications are actively progressing. Consequently, it is of paramount importance to develop and standardize Georgian equivalents for terms in these fields, as there is a substantial risk that specialists working in different areas may adopt inconsistent or divergent terminological forms. The creation of an online dictionary encompassing all branches of chemistry contributes, on the one hand, to the advancement of electronic lexicography and, on the other, to the development of the Georgian scientific school of chemistry. Such an initiative ensures that scientific works authored in Georgian not only fully reflect the terminological potential of the Georgian language but are also harmonized with international standards. In this context, 3,000 new terms in polymer and analytical chemistry were added in 2023 to an English–Georgian and Georgian–English explanatory online dictionary of chemical terminology. This work was carried out in accordance with the recommendations and proposals of the IUPAC Standing Commission, the international body responsible for the standardization and global recognition of chemical concepts, laws, and definitions.

***Keywords**: Chemistry terms, Explanatory online dictionary, Field terminology*

Introduction

For the comprehensive and effective functioning of the state language, the development of specialized, sector-specific terminology within educational and scientific domains is essential. One of the key linguistic challenges of the twenty-first century is the technologization of languages, a process that entails the establishment of an integrated electronic terminological system and the creation of a structured term bank. According to the State Language Strategy (Strategy 2022), the standardization of terminology constitutes a central objective. Achieving this objective requires the elimination of sectoral terminological fragmentation, the preservation and systematic formation of Georgian terms in accordance with ISO terminology-management methodologies, and the alignment of Georgian linguistic standards with corresponding European frameworks.

Language constitutes a dynamic and evolving system, continuously shaped by internal developments and external influences. The emergence of new technologies and technological products inevitably gives rise to corresponding lexical units and terminological structures—many of which originate uniquely within the linguistic environment of the country where the innovation occurs, and therefore lack direct analogues in other languages. Furthermore, the rapid global expansion of natural science disciplines frequently results in the semantic transformation of existing terms or the creation of entirely new ones. The timely incorporation of such units into the relevant Georgian metalanguages represents a significant challenge and, in many cases, occurs only after considerable delay. For instance, the English chemical metalanguage, characterized by its high degree of technological refinement and accessibility, places Georgian specialists in a difficult position: how to provide accurate and functional Georgian equivalents for users engaged in the study or practice of chemistry.

Literature Review

In Georgia, the last comprehensive academic terminological dictionary of chemistry was published in 1977 in four volumes. However, the foundation for its terminology relied heavily on Russian terminological sources, which themselves were often not aligned with contemporary European standards. In subsequent decades, several independent groups attempted to compile technical - including chemical-terminological dictionaries, though these were produced in limited print editions and lacked broad accessibility. The effectiveness of any terminological resource depends not only on the accuracy of its entries but also on its ease of access and searchability. Meanwhile, the accelerating pace of technological advancement has

far exceeded the rate at which new terms can be collected, adapted, standardized, and disseminated through traditional printed formats. Consequently, the need for online terminological resources has become unequivocally evident. Although the creation of the online technical dictionary (www.techdict.ge), which includes a modest number of chemical terms, was a timely and valuable initiative, it remains insufficient in addressing the complex and rapidly evolving terminological challenges described above.

A significant initial step was undertaken by our research group, which, during 2022-2023 and with the support of the Shota Rustaveli National Science Foundation, developed an explanatory online dictionary of core chemical terminology. The dictionary was based on the collection of key chemical terms established by IUPAC (Compendium of Chemical Terminology, Gold Book). The online resource currently comprises 5,737 terms and is accessible via the following web address: www.chemistry.ge/dictionary/about.php (see Fig. 1).

Fig. 1. Screenshot of the online dictionary of core chemistry terminology

Methodology

The permanent international commission of IUPAC is engaged in the continuous development of new terms and their corresponding definitions, applicable within chemistry, its specific sub-disciplines, and closely related adjacent fields. The commission's work is ongoing, reflecting the accelerating pace of advancements in science, healthcare, engineering, technology, agriculture, and ecology, which continuously present new terminological challenges for the field of chemistry. In this context, polymer chemistry is particularly noteworthy: since the

1950s, it has expanded to such an extent that it now constitutes an independent and self-contained branch of chemistry. Over the years, numerous novel polymers have been synthesized, innovative methods for their preparation or modification have been developed, and their chemical, biological, physical, technical, and other properties have been systematically investigated and characterized. These developments frequently necessitate the introduction of new terms and their precise definitions. A similar situation is observed in analytical chemistry, where technical progress, alongside the development and modernization of physicochemical analytical methods, has prompted the creation of additional terminology. The significance and lexical richness of these areas are further evidenced by the fact that in the multi-volume glossary of terms compiled by IUPAC, each of these fields has been allocated a dedicated volume (Jones & Union, 2009; Hibbert, 2019).

The terminology of polymer chemistry is compiled in the so-called "Purple Book: Compendium of Polymer Terminology and Nomenclature" (https://iupac.org/what-we-do/books/purplebook/), whereas the terminology of analytical chemistry is presented in the "Orange Book: Analytical Terminology" (https://iupac.org/what-we-do/books/orangebook/). The authors of these reference works have established a clear terminological methodology, emphasizing not only the specification of terms but also the necessity for precise definitions and comprehensive explanations. For instance, in polymer chemistry, two primary types of term definitions are recognized: one based on the molecular or structural characteristics of the polymer, and the other based on the process of polymer material formation. Accordingly, these definitions are classified as structure-oriented and process-oriented, respectively ("Basic Definitions of Terms Relating to Polymers 1974," 1974).

According to experts, the development of a unified terminology following such a methodological framework is essential not only for scientific research but also for practical applications, including litigation, patent acquisition and registration processes, and various applied fields. Discrepancies in terminology or inaccuracies in definitions may lead to misunderstandings and generate unnecessary costs (Luscombe et al., 2022).

Polymer and analytical chemistry are also rapidly advancing in Georgia, with ongoing research and practical initiatives. Consequently, it is of critical importance to develop and clarify Georgian equivalents for the terminology of these fields, as there is a substantial risk that new terms could emerge in inconsistent forms among specialists working in different sub-disciplines. The development of terms should adhere to widely recognized methodological principles, including transparency versus opacity, consistency, relevance, brevity (linguistic

economy), productivity, and linguistic correctness, with priority given to the native language (Kikvidze, 2022; *sakhelmts'ipo enis ertiani p'rograma (st'rat'egia),* 2022). At the same time, compatibility and harmonization with international terminology remain essential.

In creating a dictionary of polymer and analytical chemistry terms, our work has been guided by these methodological standards and documents, aiming to process terms in a manner that addresses both field-specific needs and the tradition of Georgian term creation, while also incorporating international best practices. In this paper, we address several issues related to the introduction and usage of new terms and their definitions in the Georgian language within these scientific fields.

Results and discussion

The Georgian literary language possesses a highly rich lexical resources, in contrast to the technical metalanguage, which reflects certain objective limitations. New technical terms often emerge at such a rapid pace that they cannot be immediately and accurately integrated into the Georgian language. This, in turn, can lead to the adoption of barbarisms or the establishment of inaccurately translated terms. In the following, several such phenomena will be examined.

A. Clarification of terms

In the English (international) language, the terms “sample” (a portion of a material taken for qualitative or quantitative analysis) and “specimen” (a specifically selected portion of a material taken from a dynamic system and assumed to be representative of the parent material at the time it is taken) are strictly distinguished. In Georgian, however, these terms have often been used as synonyms or, in some cases, interchangeably. Therefore, it is essential to establish a clear distinction in the Georgian language as well. Accordingly, “sample” should be in Georgian „nimushi“ (masalis nats'ili, romelits aghebulia tvisebiti an raodenobrivi analizistvis), whereas “specimen” should denoted as „sinji“ (masalis sp'etsialurad shercheuli nats'ili, romelits aghebulia dinamiuri sist'emidan da itvleba, rom ts'armoadgens dziritadi masalis asls misi aghebis dros)

In Georgian, the term “blank” is generally understood as aghnishnavs „tsariel“, „supta“, „sheuvsebel adgils (English-Georgian online dictionary: https://dictionary.ge). However, in chemical contexts, it is rarely used independently and typically appears as part of compound terms such as *blank materials, blank test, blank value, blank indication (background indication), solvent blank, reagent blank, matrix blank, procedural blank, field blank,*

calibration blank, instrument blank, spiked blank, and fortified blank. Clearly, a direct translation of “blank” as “empty” is inappropriate in chemical terminology. For instance, “blank materials” rendered as “„tsarieli masala“ neither accurately describes a tangible object nor possesses a meaningful physical essence, as a material cannot be truly empty. The same issue arises with “blank value” translated as “„tsarieli sidide“.

In languages with well-developed technical lexicons, “blank” is represented by terms such as „poni“, „nuli“, „puch'i“ ⴰ „k'ont'roli“. Both “puch'i” and “nuli” can be excluded because “nulovani masala” lacks real significance, and “„puch'i masala“ or „puch'i reagent'i“ does not correspond to the intended objects. In other compound terms, including „p'rotseduruli puch'i“, „savele puch'i“, „sak'alibro puch'i“, „khelsats'qos puch'i“, „sp'aik'iani puch'i“ ⴰ „gadzlierebuli puch'i“, a literal translation of “puch'i” generates semantically incorrect expressions. The lexical unit „ponuri” may be appropriate in some contexts, such as „ponuri chveneba“ and „khelsats'qos poni“, but it is semantically incompatible in combinations such as „ponuri gamkhsneli“, „ponuri reagent'i“, „ponuri mat'ritsa“, „p'rotseduruli poni“, „savele poni“ and „sakalibro poni“.

Therefore, the term “blank” should be standardized in Georgian as “„sak'ont'rolo”, resulting in the following equivalents: „sak'ont'rolo masala“, „sak'ont'rolo tsda“, „sak'ont'rolo mnishvneloba“, “sak'on¬t'rolo chveneba - ponuri chveneba“, „sak'ont'rolo gamkhsneli“, „sak'ont'rolo reagent'i“, „sak'ont'rolo mat'ritsa“, „p'rotseduruli k'ont'roli“, „savele k'ont'roli“, „sak'alibro k'ont'roli“, „khelsats'qos k'ont'roli“, „sp'aik'iani k'ont'roli“, „gadzlierebuli k'ont'roli“.

In analytical chemistry, the terms “linear” and its derivatives, such as “linearity,” frequently occur in contexts such as the linearity of a measuring system, the linearity of calibration, and the linearity of calibration curves. Unfortunately, in some Georgian-language texts, these terms have been translated directly from “line” as “khazi” (“line”), which is not considered appropriate. In these contexts, the “line” referred to mathematically corresponds to a “straight line.” Therefore, the recommended Georgian equivalents for these terms are: “sazomi sist'emis ts'rpivoba” (“linearity of a measuring system”), “dak'alibrebis ts'rpivoba” (“linearity of calibration”), and “arats'rpivobis shetsdoma” (“nonlinearity error”).

According to major English-Georgian online dictionaries (https://dictionary.ge), the term “uncertainty” is generally translated as “gaurk'vevloba” (“uncertainty”) or “bundovaneba” (“ambiguity”). In chemical texts, however, “uncertainty” rarely appears as an independent term

and is primarily encountered as part of compound expressions such as *combined standard measurement uncertainty, definitional measurement uncertainty, examination uncertainty, expanded measurement uncertainty, instrumental measurement uncertainty, measurement uncertainty, relative standard measurement uncertainty, relative uncertainty, standard measurement uncertainty, and Type A and B evaluation of measurement uncertainty*, etc. A closer examination of each term's definition indicates that a literal translation of "uncertainty" into Georgian as "gaurk'vevloba" or "bundovaneba" is not appropriate. For example, the *combined standard measurement uncertainty* is defined as the standard measurement uncertainty obtained using the individual standard measurement uncertainties associated with the input quantities in a measurement model. Similarly, *examination uncertainty* is defined as the fraction of examined values that differ from a reference nominal property value among all examined values provided.

Based on the above considerations, we propose that the term "uncertainty" be established in Georgian chemical terminology as "ganuzghvreloba". Accordingly, the term combined standard measurement uncertainty would be translated as "k'ombinirebuli st'andart'uli gazomvis ganuzghvreloba" ("st'andart'uli gazomvis ganuzghvreloba, romelits miigheba gazomvis modelshi shemavali sidideebis individualuri st'andart'uli gazomvis ganuzghvrelobebis gamoqenebit"). The corresponding Georgian equivalents for the other related terms are as follows: definitional measurement uncertainty – "gazomvis gansazghvruli ganuzghvreloba"; examination uncertainty – "gamok'vlevis ganuzghvreloba"; expanded measurement uncertainty – "gazomvis gapartoebuli ganuzghvreloba"; instrumental measurement uncertainty – "inst'rument'uli gazomvis ganuzghvreloba"; measurement uncertainty – "gazomvis ganuzghvreloba"; relative standard measurement uncertainty – "pardobiti gazomvis st'andart'uli ganuzghvreloba"; relative uncertainty – "pardobiti ganuzghvreloba"; standard measurement uncertainty – "gazomvis st'andart'uli ganuzghvreloba"; and Type A and B evaluation of measurement uncertainty – "gazomvis ganuzghvrelobis A da B t'ip'ebis shepaseba."

A similar situation arises with the term "bias." According to major English-Georgian dictionaries, "bias" can be used as a noun, adjective, or verb, and is generally translated as "mik'erdzoeba", "midrek'ileba", "mimartuleba"/"gankhra", or even as "iribi"/"iribad gach'rili". In chemistry, however, the term appears in compound expressions such as *measurement bias* (estimate of a systematic measurement error*), instrumental bias* (average of replicate indications minus a reference quantity value), and *laboratory bias* (contribution to

measurement bias attributed to systematic effects on measurement results obtained in a laboratory).

From these definitions, it is clear that “bias” denotes a deviation associated with a specific object - whether a measurement, an instrument, or a laboratory - reflecting a systematic difference between the observed result and the true or reference value. In particular, laboratory bias refers to results that are unique to a specific laboratory and is intended to indicate the validation and general recognition of the obtained measurements. If a measurement obtained by a specific instrument, laboratory, or method cannot be replicated under other instruments, laboratories, or methods, the reliability of the result becomes insufficient. Consequently, repeated measurements using different methods or in different laboratories are often conducted, and the results are compared. Naturally, these results do not coincide with absolute accuracy but are expected to differ only within a defined (insignificant) range.

Therefore, instead of translating the above terms literally as “mik'erdzoebuli gazomva”, “khelsats'qos mik'erdzoeba” or “laborat'oriuli mik'erdzoeba”, it is preferable to adopt a Georgian equivalent that conveys „…shorisi gadakhra“. Accordingly, the terms can be rendered in Georgian as follows: “gazomvatashorisi gadakhra” (“measurement bias”), “khelsats'qotashorisi gadakhra” (“instrumental bias”), and “ laborat'oriatashorisi gadakhra” (“laboratory bias”).

In polymer chemistry, the term “strand” is widely used. In contemporary English, according to the Cambridge Dictionary (2022), it is defined as “a thin thread of something, often one of a few, twisted around each other to make a string or rope.” According to major English-Georgian online dictionaries (https://dictionary.ge), “strand” has several equivalents, including “narti,” “ts'na,” “tsalk'euli boch'k'o,” “bats'ari,” and “dzapi.” For example, a strand of wood - shalis dzapis tsalk'euli boch'k'o, a strand of cotton - bambis narti/dzapi.

In polymer chemistry, “strand” appears in multiple compound terms, such as *double-strand chain, double-strand copolymer, double-strand macromolecule, double-stranded deoxyribonucleic acid, multi-strand chain, multi-strand macromolecule, quasi-single-strand polymer, regular single-strand polymer, single-strand chain, single-strand macromolecule, single-strand polymer, and single-stranded deoxyribonucleic acid*. Notably, the term single-strand chain is defined as a chain comprising constitutional units connected in such a way that adjacent units are joined through two atoms, one on each constitutional unit („jach'vi, romelits moitsavs iseti sakhit dak'avshirebul st'rukt'urul erteulebs, rom mimdebare st'rukt'uruli erteulebi ertmanets uertdebian ori at'omis (tito at'omi titoeul st'rukt'urul erteulze) meshveobit“). In

contrast, a double-strand chain is defined as a chain consisting of two interconnected sequences of rings, where adjacent rings share three or four atoms, two of which belong to one chain and one or two to the other („jach'vi, romelits shedgeba ertmanettan dak'avshirebuli ori shemadgeneli jach'visagan. isini ertmanets uk'avshirdeba momijnave st'rukt'uruli erteulebis sami an otkhi at'omis meshveobit, romeltagan ori ganlagebulia ert shemadgenel jach'vze, kholo erti an ori - meoreze.“).

Based on these definitions and considering polymer structure, chemical composition, and connectivity, it is appropriate to adopt the Georgian equivalent “რიგა” for “strand” in polymer chemistry. Accordingly, the Georgian equivalents for the above terms are as follows: double-strand chain – “orriga jach'vi”; double-strand copolymer – “orriga tanap'olimeri”; double-strand macromolecule – “orriga mak'romolek'ula”; double-strand polymer – “orriga p'olimeri”; double-stranded deoxyribonucleic acid – “orriga dezoksiribonuk'leinmzhava”; multi-strand chain – “mravalriga jach'vi”; multi-strand macromolecule – “mravalriga mak'romolek'ula”; quasi-single-strand polymer – “k'vazi ertriga p'olimeri”; regular single-strand polymer – “regularuli ertriga p'olimeri”; single-strand chain – “ertriga jach'vi”; single-strand macromolecule – “ertriga mak'romolek'ula”; single-strand polymer – “ertriga p'olimeri”; and single-stranded deoxyribonucleic acid – “ertriga dezoksiribonuk'leinmzhava.”

In general, macromolecules that contain a single branching point with linear side chains attached to that point are referred to as “star macromolecules.” The nomenclature of such macromolecules is specified according to the number of side chains. For instance, a macromolecule with five attached linear fragments is called a five-star macromolecule, and one with seven fragments is called a seven-star macromolecule, and so on. While a literal translation of these terms into Georgian would yield “khutvarsk'vlaviani mak'romolek'ula” (“five-star macromolecule”) and “shvidvarsk'vlaviani mak'romolek'ula” (“seven-star macromolecule”), we consider it more precise to introduce the term “kimiani” in Georgian. Accordingly, the proposed Georgian equivalents are “khutkimiani varsk'vlavisebri molek'ula” (“five-armed star macromolecule”) and “shvidkimiani varsk'vlavisebri molek'ula” (“seven-armed star macromolecule”).

B. Definition of terms

In Georgian terminology development, a major challenge is the precise identification of equivalents and definitions for terms that are closely related in meaning. Due to similarities in meaning and the absence of rigorously defined definitions for each term, they are often

mistakenly used as synonyms, which is unacceptable. A representative group of such terms includes Accuracy, Precision, Repeatability, and Reproducibility.

The term Accuracy (“sizust'e”) should be used to indicate how close measurement results are to the true value of the quantity being measured, as well as to each other. Precision (“p'retsiziuloba”) should be applied when comparing multiple measurement results; it describes how close these results are to one another. When comparing measurement results obtained under the same conditions—by the same operator, in the same laboratory, using the same instrument—the term Repeatability (“ganmeorebadoba”) is appropriate. Conversely, Reproducibility (“gadamots'mebadoba”) refers to the comparison of results obtained under different conditions, such as different operators, instruments, laboratories, or at different times.

Accordingly, the definitions of these terms in Georgian should be formulated as follows:

sizust'e - gazomvis shedegis damtkhvevis sizust'e gasazomi sididis ch'eshmarit' mnishvnelobastan.

p'retsiziuloba - gansazghvrul p'irobebshi erti da imave an msgavs obiekt'ebze ganmeorebiti gazomvebit mighebuli chvenebebis an gazomili sidideebis mnishvnelobebis siakhlove.

ganmeorebadoba - erti da imave p'irobebshi (erti da igive op'erat'ori, erti da igive ap'arat'ura, erti da igive laborat'oria da/an drois skhvadaskhva int'ervalis shemdeg) ertsa da imave sagamotsdo masalaze erti da imave metodit mighebul damouk'idebel shedegebs shoris damtkhvevis khariskhi. ganmeorebadobis sazomi aris st'andart'uli gadakhra, romelits ganisazghvreba t'erminit „ganmeorebadoba“, rogorts ganmeorebadobis st'andart'uli gadakhra.

gadamots'mebadoba - skhvadaskhva p'irobebshi (skhvadaskhva op'erat'ori, skhvadaskhva ap'arat'ura, skhvadaskhva laborat'oria da/an drois skhvadaskhva int'ervalis shemdeg) ertsa da imave sagamotsdo masalaze erti da imave metodit mighebul damouk'idebel shedegebs shoris damtkhvevis khariskhi. aghts'armoebadobis sazomi aris st'andart'uli gadakhra, romelits ganisazghvreba t'erminit „gadamots'mebadoba“ rogorts gadamots'mebadobis st'andart'uli gadakhra.

According to older IUPAC recommendations, the definition of an atactic macromolecule was: “A regular macromolecule in which the configurational (base) units are not all identical” (“regularuli mak'romolek'ula, k'onpiguratsiuli (sabaziso) erteulebi ar arian mtlad ident'urebi”) (IUPAC, 1996, 68, 2287). This definition was revised in the 2009 recommendations, which state: “Regular macromolecule that has an equal number of the possible configurational base units in a random sequence distribution” (“regularuli mak'romolek'ula, romelsats shemtkhvevit

mimdevrobit ganats'ilebashi akvs shesadzlo k'onpiguratsiuli sabaziso erteulis tanabari raodenoba") (Jones & Union, 2009).

C. Term Formation

In the development of Georgian chemical terminology, priority should be given to finding or creating native equivalents, and the direct importation of new terms should be minimized. At the same time, considerable attention must be paid to the practicality, clarity, and correspondence with existing terms.

In English, suffixes such as "-and" and "-ant" denote different roles in chemical processes: the "-and" suffix indicates the object upon which an action is performed, while the "-ant" suffix indicates the subject that acts on that object. For example, a *titrand* is a solution to be titrated, whereas a *titrant* is the solution that performs the titration. Similarly, a *measurand* is the quantity to be measured, while a *measurant* is the means of measurement. The Georgian equivalent "gasazomi" is fully acceptable for measurand, accurately describing the object of measurement. However, the same cannot be said for titrand. Since the terms "t'it'ri" and "t'it'rant'i" have been widely used for a long time, we consider it appropriate to establish "t'it'randi" as the Georgian equivalent of titrand, replacing alternative forms such as "gasat'it'ri," "sat'it'ravi," and "sat'it'ri."

The method based on deoxyribonucleic acid hybridization, used to detect a DNA fragment with a specific nucleotide sequence, is named after its inventor and is known as the Southern blot. Later, analogous methods were developed for RNA (Northern blot) and proteins (Western blot). In the creation of these latter two terms, the inventors intentionally used "North" and "West" to indicate their conceptual relation to the original Southern blot method. In developing Georgian equivalents, if "Southern" is considered the scientist's surname, it should be preserved unchanged, and the method should be called "sauzernis blot'ireba" ("Southern blotting"). However, the same approach is not appropriate for Northern and Western blot, because in these cases "Northern" and "Western" refer to geographic directions rather than scientists' names. Furthermore, basing the Georgian equivalents on geographic terms - such as "samkhret blot'ireba," "chrdiloet blot'ireba," or "dasavlet blot'ireba" - would be misleading, as the methods have no relation to directions. Therefore, the recommended Georgian equivalents for these methods are: Southern blot – "dnm-is blot'ireba" ("DNA blotting"), Northern blot – "rnm-is blot'ireba" ("RNA blotting"), and Western blot – "tsilis blot'ireba" ("protein blotting").

Polymer chemistry is developing at a very rapid pace due to technological progress. Today,

numerous new polymers with specific compositions, structures, and properties have been created. Naturally, these new materials require appropriate names and technological equivalents. In some cases, the nomenclature of polymers is based on their resemblance to familiar or widely known objects. Consequently, contemporary polymer terminology has introduced terms such as:

- **switchboard model - k'omut'at'oris modeli** (k'rist'alurobis modeli, romelshits mak'romolek'ulis k'rist'alizebuli segment'ebi miek'utvneba imave k'rist'als, tumtsa gheroebi shemtkhvevitad aris dak'avshirebuli.
- **shish-kebab structure - shish-kababis st'rukt'ura** (boch'k'ovani k'rist'alebisgan shedgenili ormagi st'rukt'uris p'olik'rist'aluri morpologia ep'it'aksiurad gamozrdili lamelaruli k'rist'alebit, romelta gheroebi boch'k'ovani gherdzis p'araleluria).
- **ladder macromolecule - k'ibisebri mak'romolek'ula** (orriga mak'romolek'ula, romelits shedgeba uts'qvet'i tanmimdevrobis shemtsveli birtvebisgan, sadats mimdebare birtvebs gaachnia erti an met'i saziaro at'omi).
- **comb macromolecule - savartskhlisebri mak'romolek'ula** (dziritad jach'vshi mravali sampunktsiuri gansht'oebis ts'ert'ilis mkone mak'romolek'ula, rodesats titoeul gansht'oebis ts'ert'ilshi dak'avshirebulia khazovani gverditi jach'vebi).
- **worm-like chain - ch'iismagvari jach'vi** (hip'otezuri ts'rpivi mak'romolek'ula, romelits moitsavs uts'qvet'ad dakhveul usasrulod ts'vril jach'vs. dakhvevis mimartuleba titoeul ts'ert'ilshi shemtkhvevvitia. modeli aghts'ers jach'vis sikhist'is skhvadaskhva donis mtel sp'ekt'rs khist'i gherodan dats'qebuli shemtkhveviti khviebit damtavrebuli, da gansak'utrebit, sasargebloa khist'i jach'vebis gamosakhvisatvis. lit'erat'urashi aset jach'vebs zogjer uts'odeben p'orod-k'rat'k'is jach'vebs).
- **salami-like morphology - saliamisebri morpologia** (mravalpaziani morpologia, romelshits erti p'olimeris disp'ersiuli pazis domenebi sheitsavs da mtlianad aertianebs meore p'olimeris pazis mraval domens. meore p'olimeri sheidzleba iqos imave shedgenilobis, rogorisats uts'qvet'i pazis domenia).

As observed, in the development of Georgian equivalents, two primary models of term formation have been employed. The first model is based on derivation from related roots combined with a limiting element, for example: “k'omut'at'oris modeli” and “shish-kababis st'rukt'ura”. The second model utilizes derivational suffixes that indicate a property, such as “-

ebr" or "*-magvari"*, applied to a root combined with a limiting element. Examples of this approach include: "saliamisebri morpologia" ("salami-like morphology"), "k'ibisebri mak'romolek'ula" ("ladder-like macromolecule"), "savartskhlisebri mak'romolek'ula" ("comb-like macromolecule"), and "ch'iismagvari jach'vi" ("worm-like chain").

D. Term Borrowing

In some cases, it is not possible to find a fully developed Georgian equivalent for new international terms, or for certain practical reasons, direct borrowing is more appropriate. Examples of such terms include:

- **permeate** - p'ermeat'i: p'enet'rant'ebis shemtsveli nak'adi, romelits gamodis membranidan.
- retentate stream - ret'ent'at'is nak'adi: membranastan p'irveladi k'ont'akt'is shemdeg shek'avdeba membranuli daqopis shedegad.
- **pervaporation** - p'ervap'oratsia: membranebze dapudznebuli p'rotsesi, romelshits nedleulisa da ret'ent'is nak'adebi orive tkhevadi pazaa, kholo p'ermit'i membranis zedap'irze gamodis ortklis sakhit.
- **perfusate** - p'erpuzat'i: saekst'raktsio pazis nak'adi, romelits shedis dializis modulshi.
- **impinger** - imp'injeri: minis mart'ivi barbot'azhuri k'amera akroladi analit'ebis vak'uumuri nimushis asaghebad. k'amerashi airis nak'adi gaivlis saekst'raktsio khsnars, romlis danishnulebaa samizne analit'ebis dach'era da k'ontsent'rireba.
- **sublation** - sublatsia: plot'atsiis p'rotsesi, romlis drosats erti an ramdenime analit'i adsorbirdeba khsnarshi modzravi airis busht'uk'ebis zedap'irze da grovdeba ts'qaltan sheurevadi gamkhsnelis zeda penashi an sorbent'ur damch'ershi.
- **avidity** - aviduroba: reaktsiis gansazghvrul pizik'ur-kimiur p'irobebshi ant'ishrat'shi arsebuli ant'iskheulebis qvela damak'avshirebeli ubnis jamuri apinuroba.

Conclusion

In this article, we have discussed issues related to the development of Georgian equivalents for polymer and analytical chemistry terminology, including the identification of precise equivalents, clarification of existing terms, differentiation of closely related terms based on contextual definitions, the formation of terms with specific derivational patterns, and term borrowing. All of these efforts serve a central goal: to establish a unified Georgian terminology for chemistry and its subfields that accurately reflects international terms while respecting the rules of Georgian word formation and the experience of term creation.

The creation of an online dictionary covering all fields of chemistry will support, on the

one hand, the development of electronic lexicography, and on the other hand, the advancement of the Georgian scientific school of chemistry. This will ensure that Georgian-language publications by local authors not only demonstrate the terminological potential of the Georgian language but are also fully harmonized with international standards.

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