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Uniform chemical terminology for Indian languages

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Abstract

A comparison is made between German and Russian terminological derivations in chemistry and the methods used by Germans and Russians to solve problems related to the formation of scientific words. A study of this comparison, it is believed, can help us in the development of scientific words in Indian languages.

Key words : Chemical terminology, Indian languages.

1. Introduction

In order to understand the use of scientific terms correctly in speech and in scientific and academic work, students should have an idea of the composition and characteristic features of the formation of scientific words.

A knowledge of the principles of word formation in German and Russian can help science students multiply their vocabulary in the Indian language used for instruction. A great amount of time can be saved by learning to pick out the " root " of a word and seeing how new words can be made up by the addition of certain endings to the " root ". In addition, new words are being coined every day and dictionaries cannot keep pace with this new vocabulary. Invariably, the student will often have to arrive at the meaning of words not given in the dictionary.

Latin language was universal scientific language in which the transactions of the scientists of different countries were published. Greek and Latin words were used as material for the formation of terms, common for different European languages. Many elements are named by the most characteristic sign denoting the Greek or Latin word. Latin roots have such terms—valency, molecule, dissociation, dispersion, diffusion, etc. These examples show that words of Latin and Greek origin which are available in different European languages dominate in the composition of chemical teminology and are universal terms.

As a rule, universal terms need not be translated into Indian languages. Explaining the reason for the spread of borrowed words in the language in place of the native words, Belinskii says "this is due to the advantage of the original over a copy....an idea or concept feels as if more comfortable and speciousness in such words where it was expressed for the first time and then it is born with the word and grows with the word and the word becomes more and more untranslatable". However there are many cases where Indian and foreign words can be used for denoting the same phenomenon process. The names/words of such elements as oxygen and hydrogen are derived from the Latin words hydrogennum and oxigennum. Coining equivalents for oxygen, hydrogen and nitrogen, etc., is not necessary although in Hindi, amaljan, udajan and sorajan are quite clear from the translation point of view. While coining equivalents, we should not follow blindly the erroneous scientific notion associated with the original term to be translated. Amaljan is a literal translation of the word oxygen (Greek: oxys – pungent: geenao—to produce) which acquired the name as a result of Priestley's erroneous impression that all acids were formed by the combination of non-metallic substances with this respirable air. In fact, the same erroneous notion has got into German also where the equivalent of Oxygen "Sauerstoff", means a substance producing sourness.

2. English nomenclature

As we have already noticed, the use of some prefixes of Latin and Greek origin is active in the language of chemistry. Latin and Greek numerations are used as prefixes as such : *bi*, *di*, *tetra*, *penta*, *hexa*, etc. For the words such as "biprism", the Sanskrit prefix *dvi-* for the Latin prefix *bi-* can be introduced, while retaining the prism untranslated. Mendeleef, for example, used Sanskrit prefixes *eka-* and *dvi-* for naming his predicted elements such as *eka*-caesium and *dvi*-manganese, subsequently named as francium and rhenium after their discovery.

In languages, there will be many adjectives with one and the same root but with different suffixes. Thus, for example, from the word "warm", it is possible to form a few sets of adjectives. We can call with one adjective: water, winter, sea, weather, wind, etc. But with another adjective we can call: energy, balance, etc. The use of these adjectives does not confuse since this avoids incorrect understanding. As for illustrations, see section 4 to know how the Russians have solved such problems. Ambiguity exists even in German and Indian languages in such similar terminology. For illustrations see sections 3 and 5 respectively.

There should be consistency in the representation of an idea in whatever combination it occurs. Different terms should not be used to represent one and the same idea in different combinations. The terms for allied ideas should be cognate and differentiated[1]. It is the idea which should be verbally translated. The intended idea should be represented directly and not indirectly. Etymology is the only guide when a new term is invented and the translator takes the responsibility of devising a label for it in another language. These have been demonstrated with a number of examples in the respective nomenclatures of English, Russian and German in sections 2, 3 and 4. Table I shows how the names of the acids are referred to. While reading the table, the following note as well as sections 3 and 4 should be studied carefully.

Table I

Formula/ Elements	English	Russian	German
H_3PO_4	Phosphor*ic* acid	Fosfor *naya* kislota	die Phosphor*säure*
H_3PO_3	Phosphor*ous* acid	Fosfor *istaya* kislota	die Phosphor*ige* Säure
H_3PO_2	Hypophosphor*ous* acid	Fosfor *novatistaya* kislota	die *unter* phosphor*ige*Säure
H_2MnO_4	Mangan*ic* acid	Margantso*vistaya* kislota	die Mangansäure
$HMnO_4$	Permangan*ic* acid	Margantso*vaya* kislota	die *ueber* Mangansaure
HF	Hydrofluor*ic* acid	Ftoristovodorod*naya* kislota Ftorovodorod*naya* kislota	die FluorwasserstaffSäure
HI	Hydroiod*ic* acid	Iodistovodorod*naya* kislota Iodovodorod*naya* kislota	die JodwasserastoffSäure
Na_2S	Sodium sulph*ide*	Sernistyi natrii Sul'fid natriya	das Schwefel Natrium
Fe_2O_3	Ferr*ic* oxide	*Ok*is' zheleza *Ok*is' zheleza(3)	Eisen*oxyd* Ferr*i*oxyd Eisen (III)-Oxyd
FeO	Ferr*ous* oxide	*Za*kis' zheleza *Ok*is' zheleza (2)	Eisen*oxydyl* Ferro*oxyd* Eisen (II)-Oxyd
H_2O_2	Hydrogen *Per*oxide	*Per*ekis' vodoroda	Wasserstoff*super*oxyd
F	Fluor*ine*	Ftor	Fluor
Fe	Iron	Zhelezo	Eisen
H	Hydrog*en*	Vodorod	Wasserstoff
K	Potass*ium*	Kalii	Kalium
S	Sulphur	Sera	Schewfel
Mn	Manganese	Marganets	Mangan
Na	Sod*ium*	Natrii	Natrium
O	*Oxygen*	Kislorod	Sauerstoff
P	Phosphor*ous*	Fosfor	Phosphor

It is customary to apply

(1) Names ending in the letter *-um* to the metallic elements, *e.g.*, Sod*ium*, calc*ium*, magnes*ium*, etc.

(2) Names ending in the letters *-en*, *-ine*, *-on*, etc., to the non-metallic elements, *e.g.*, hydrog*en*, oxyg*en*, brom*ine*, silic*on*, arg*on*, etc. But non-metals like selenium, tellurium have names ending in *-um* and those of sulphur, phosphorus, etc., do not come under (2) above.

3. German nomenclature

In German[2] two types of chemical nomenclature exist: one conforming generally to the universal and another which existed before the universal terminology was generally accepted. Most modern authors use the universal nomenclature but older terms are still widely encountered.

Acids

(*a*) Oxy-acid compounds the word "Säure" (which in German means acid and stands in the feminine gender) with the names of element.

(*b*) Lower acids (*-ous* acids and *hypo-......ous* acids) are named by forming an adjective with the ending *-ig* (*ous*) from the name of the element, and qualifying with it the noun "Säure". Hypo-acids prefix *-unter-* (*hypo-*, below) to the *-ig* adjective.

(*c*) Higher acids take "*uber*" (per, above) before the name of the normal acid. The prefixes *per-* and *hypo-* are also used.

(*d*) Hydracids compound the word "Wasserstoffsäure" (hydrogen acid) with the substance acidified.

Compounds

Binary compounds are often named by using the name of the electronegative element first.

Oxides

(*a*) The addition of certain endings to the German name of the element. These endings are :

-Oxyd (*-ic* oxide) or *oxydul* (*-ous* oxide)

-id (*ic*, *ide*) or *-ur* (*ous ide*).

(*b*) Addition of the universally recognised suffixes to the Latin or Greek names of the element, with the letter -I- interpolated for *-ic*, the letter *-o-* for *-ous*.

(*c*) Indication in brackets, after the name of the element, of its valence in the particular compound.

Higher oxides, etc., may also have the prefix *super-*, *hyper-*, or *per-*.

The following example shows how the universal terms have been translated ambiguously. The pure German word " Waermemesser " means both calorimeter and thermometer and therefore is not useful as a technical term. However, in modern scientific literature the Latin- and Greek-based universal words calorimeter and thermometer are freely used. While using the terms, nobody is aware that both the Latin word *Calor* and Greek word *Therm* mean heat. We are concerned only with the technical sense they convey. If that be so, then calorimeter and thermometer as universal terms are quite acceptable to us. But the physical entities they measure must also be translated. Another similar example is shown in section 5.

4. Russian nomenclature

Acids

For acids in which the element shows different degrees of oxidation, the following structure of their names has been assumed[3]. The suffix and ending *-naya*, *-novataya*, *-istaya* *-ovatistaya* are added to the name of the metalloid.

A clear distinction must be made between suffixes and inflectual endings in Russian. For example, by adding to the root, *fosfor*, the suffixes *-n-* and *-ist*, the stems of two adjectives, *fosforn* and *fosforist* are formed. These two adjectives are used to indicate different valence states. The endings *-aya-* have purely grammatical significance and indicate nothing as to the valence states. The Russian names of acids containing oxygen consist of a noun, " kislota " (meaning acid and stands in the feminine gender), preceded by an adjective whose suffix may denote the state of oxidation of the acid forming element. The suffixes, *-novatist-*, *ist-* (or *-ist-* or *-ovist-*) novat- and -n- are used in that order to denote successively higher states of oxidation of the acid forming element.

Compounds

Nomenclature of salts of acids not containing oxygen is thus formed. The suffix with the ending *-istyi* is added to the Russian name of metalloid. Or else the suffix *-id-* is added to the Latin name of the metalloid.

Oxides

(*a*) The different valence states of the metals in oxides may be denoted by adding various prefixes to the root, *-kis*.

(*b*) If a metal forms only one oxide of salt forming basic character, the oxide is termed " *okis* ".

(*c*) If a metal forms two oxides having basic properties, the lower oxide is termed "*zakis*" and the higher oxide, "*okis*".

(*d*) A peroxide is usually termed "*perekis.*"

It should be noted that the root "-kis-" is very important, as many words such as "kislota" (acid), "okislenie" (oxidation) are formed from this root. Similarly, in German also, the word "Säure" denotes acid. In both the languages. "acid" belongs to the feminine gender.

Sometimes Russian authors use numerals (either Arabic or Roman) to designate different valence states of metals. Designating valence states is a simple and unambiguous method. The distinction between some of the important inorganic compounds should be noted.

As already stated, the noun "kislota" in Russian meaning "acid" stands in the feminine gender. Hence the adjective preceding the noun also stands in the same gender in the nominative case, and the suffix becomes *-aya-*.

Under "oxides of metals", the term "okis" "zheleza" means oxide of iron (literally) because the noun iron is in the genitive case with neuter ending -o- and this -o- is changed into -a-. The apostrophe ' in okis ' near the letter "s" may be ignored for our purpose. It merely denotes a soft mark. For the same reason, we find the letter "a" at the end of the word "vodorod" and "i" at the end of the word "med".

As compared to Russian, the German terms are much simpler. However, the former is more precise in its nomenclature.

In section 2, it has been pointed out that in languages there will be many adjectives with one and the same root but with different suffixes. For example in the Russian nomenclature, the adjective used for *warm* is in the form "tyoplyi" meaning warm. But when referring to energy, etc., the same form with a slight variation as "teplovoi", meaning heat, thermal, is used. One should not mix up the use of these adjectives since this leads to incorrect understanding. For example: *tyoplye luchi solntsa* but *teplovye luchi* (in physics): luchi = rays: Solntsa = of the Sun[4].

One adjective "glass" can be used for denoting the production of glass (glass plants, glass production) and another for denoting the objects made out of glass (glass jar, glass flask). For indicating objects made of glass, the Russians use the adjective "*steklyannaya*" kolba for glass flask. For indicating the production of glassware, they use the term "*stekol'yi*" zavod. Continuing with similar examples we are convinced that adjective with one and the same root but different suffixes can be used with strict designed groups of objects and concepts.

Salts

Salts are classified into normal, acidic and basic by their composition. Two types of nomenclature exist for salts in Russian[4].

According to one nomenclature, the name of normal salts of acids containing oxygen is derived from the name of the acid forming salt and the name of the metal entering into this salt.

K_2SO_4	Sernokislyi kalii	Potassium sulphate
K_2SO_3	Sernistokislyi kalii	Potassium sulphite
$KClO_4$	Khlornolkislyi kalii	Potassium perchlorate
$KClO_2$	Khloristokislyi kalii	Potassium chlorite
KClO	Khlornovatistokislyi kalii	Potassium hypochlorite.

The most important method is to derive the name of a salt. For example, Na_2SO_4 is derived as follows :

Let us start with the name of the acid, *viz.*, H_2SO_4 (Sernaya kislota).

The stem of the adjective *Sernaya* is *sern*. The letter *-O-* is attached to the stem of the adjective used in naming the acid. Thus, we get serno- to which the stem of the name of the metal is now added, to form, in this case, Sernonatri-. To this is now added a further suffix which is usually either -ov- or -ev- if the metal forms only one series of salts corresponding to a single valence state. Thus, the stem of an adjective, *e.g.*, sernonatriev-, is formed. This adjective together with the proper grammatical ending is used to modify the noun, Sol' (salt) in feminine gender. Thus, the nominative case of one Russian name for Na_2SO_4 is Sernonatrievaya Sol'.

If the metal forms salts corresponding to two different valence states, the same procedure may be followed with this difference. The suffix -ov- or its -ev- is not used. Instead the suffix -N- is used to denote the higher valence state, while -ist- is used for the lower valence state.

The following examples illustrate the names of salts derived from acids containing oxygen.

Khlornovatistokal' tsievaya Sol'	$Ca(ClO)_2$	Calcium hypochlorite
Khloristolitievaya Sol'	$LiClO_2$	Lithium chloride
Khlornovatikalievaya Sol'	$KClO_3$	Potassium chlorate
Khlornobarievaya Sol'	$Ba(ClO_4)_2$	Barium perchlorate
Sernozheleznaya Sol'	$Fe_2(SO_4)_3$	Ferric sulphate

Sernozhelezistaya Sol'	$FeSO_4$	Ferrous sulphate
Sernistostrontsievaya Sol'	$SrSO_3$	Strontium sulphite.

Another method for naming Na_2SO_4 or similar salts of acids containing oxygen, starts with the name of the acid, *e.g.*, Sernaya kislota, H_2SO_4. As before, the letter -O- is attached to the stem of the adjective used in naming the adjective, *e.g.*, Serno-. To this root Kis- and the letter -L- are added to form sernokisl-. This is the stem of an adjective which is used to modify the name of the metal contained in the salt. Thus, we have Sernokislyi natrii, Na_2SO_4. Other examples are :

Bromnovatististokislyi ammonii	NH_4BrO	Ammonium hypobromite
Khromovokislyi kalii	K_2CrO_4	Potassium chromate
Pir-mysh'yakovokislyi magnii	$Mg_2As_2O_7$	Pyromagnesium arsenate.

Another method of nomenclature which is close to the universal is the use of Latin names of acid radicals for naming the salt.

Examples :

K_2SO_4 Sul'fat kaliya, literally it is sulphate of potassium (Potassium sulphate)

K_2SO_3 Sul'fat kaliya, sulphite of potassium (Potassium sulphite).

The prefix per- or Nad- $K_2S_2O_8$ (-nadsernokislyi kalii—persulfat of kaliya) is added to the name of the normal salt for making salts of nadkislota (Peroxide group is present)[1]

Some salts which do not have peroxide structure carry the name of " Persalts ".

$KClO_4$ Perchlorate kaliya (named after khlorat kaliya) Potassium perchlorate.

$KMnO_4$ Permanganat kaliya (named after manganat kaliya) Potassium permanganate.

Another method used for naming salts is to construct a phase consisting of (I) an adjective used to name the acid involved, (2) the word Sol' (salt), and (3) the genitive case of the name of the metal oxide from which the salt may be considered to be derived.

Azotnaya sol' okisi rtuti	$Hg(NO_3)_2$	Mercuric nitrate
Azotnokislaya sol' zakisi rtuti	$HgNO_3$	Mercurous nitrate
Sernokislaya sol' okisi zheleza	$Fe_2(SO_4)_3$	Ferric sulphate
Sernokislaya sol' zakisi zheleza	$FeSO_4$	Ferrous sulphate.

The literal translation of the above series will be " Nitric salt of oxide of mercury"

Names of salts of acids not containing oxygen is formed as follows;

The suffix with the ending -istyi is added to the Russian name of metalloid. Or else the suffix -id- is affixed to the Latin name of the metalloid.

Examples :

Na_2S	Sodium sulphide (Sernistyi natrii, sul'fid natriya)
NaCl	Sodium chloride (Khloristyi natrii, khlorid natriya)
$SbCl_3$	Khloristaya Sur'ma, trekhkhloristaya sur'ma,
$SbCl_5$	Khlornaya sur'ma, pyatikhloristaya sur'ma.

The above examples illustrate typical Russian nomenclature of compounds of metals with various electronegative elements. It should be noted that the Russian name of each of these compounds consists of an adjective followed by a noun. The noun in each case denotes the metal. Both the adjective and noun are in the nominative singular case. The following important generalities should be noted.

In compounds, which consist of a metal and a single electronegative element, the valence state of the metal may be indicated either by the use of a suffix (-ist- or -N-) or by a prefix (polu-, semi-, odno-, mono-, dvu-, di-, trekh-, tri-, etc.) affixed to the adjective denoting the electronegative element. These prefixes (and also mono-, polu) may also be used in naming compounds *e.g.*, Na_2S_5, Na_2S_n, which differ with respect to composition but not with respect to the valence state of the metal. When so used, the pair of suffixes -N- and -ist- indicate, respectively, the higher and lower valence states of the metal. The suffix -ist- is used when there is no need to indicate different valence states of the metal *e.g.*, NaCl, AlI_3 or when such valence state is indicated by a prefix *e.g.*, pyati-, penta-.

Acid salts

The names of acid salts[4] as well as the normal salts are formed with the addition of the word *Kislyi* or the prefix bi (dvu-).

$KHSO_4$	*Kislyi sernokislyi kalii, bisul'fat kaliya*
$NaHSO_3$	Kislyi sernistokislyi natrii, bisul'fit natriya
NaHS	Kislyi sernistyi natrii, bisul'fid natriya
$NaHCO_3$	Dvuuglekislyi natrii, bikarbonat natriya

(The Russian word "Kislyi" means acidic).

The Russian names of acid salts may be formed (1) by using the adjective *Kislyi*, (2) by prefixes or adjectives derived from numerals, or (3) by names corresponding to the English *bisulfate of sodium* or the like.

$NaHSO_4$	Kislyi sernokislyi natrii, bisul'fat natriya
$CaHPO_4$	Kislaya fosfornokal ' tsievaya sol '
$NaHCO_3$	Kislyi uglekislyi natrii, dvuuglekislyi natrii, bikarbonat natriya.

The various numerical prefixes and the adjectives *srednii* (neutral) and normal'nyi (normal) are sometimes used to avoid possible ambiguity when speaking of neutral salts.

A salt produced by the displacement of a portion only of the replaceable hydrogen atoms present in a molecule of an acid by a metal (or a group) is called an acid salt.

Examples :

$Ca_3(PO_4)_2$	Srednyaya fosfornokal ' tsievaya sol ', normal'naya fosfornokal-' tsievaya sol '. Literally it is acidic phosphate of calcium.
$Ca(H_2PO_4)_2$	Kislyi fosfat kal'tsiya, digidrofosfat kal'tsiya, odnozameshchyonnyi fosfat kal'tsiya. (Monosubstituted phosphate of calcium.)
$CaHPO_4$	Kislyi fosfat kal'tsiya, monogidrofosfat kal'tsiya, dvuzameshchyonnyi fosfat kal'tsiya.
Na_3PO_4	Fosfornotrekhnatrievaya sol', normal'naya fosfornonatrievaya sol '.

Basic salts

The *osnovnaya, osnovoi* is affixed before the name inherent to the normal salt for naming the basic salts[4]. Osnovnaya or osnovnoi means basic (salt)

Examples :

$CuCO_3 \cdot Cu(OH)_2$	Osnovnoi karbonat medi, osnovnaya uglemednaya sol'
$BiOH(NO_3)_2$	Osnovnoi nitrat vismuta, osnovnoi azotnokislyi vismut

Osnovnaya fosforno-zheleznaya sol'	Basic ferric phosphate
Osnovnaya uglesvintsovistaya sol'	Basic lead carbonate
Osnovnaya zotnaya sol' okisi rtute	Basic mercuric nitrate.

For some salts, the names with no reference to their structure are adopted and their names are neither associated with acids nor with metals forming them.

Examples :

$Na_2SO_4 \cdot IOH_2O$	Glauberova sol' (Glauber's salt) Sodium sulphate decahydrate
$KClO_3$	Betrolletova sol' (Berthollet's salt) Potassium chlorate
$NaHCO_3$	Pit'evaya soda (sodium bicarbonate), literally drinking soda
$MgSO_4 \cdot 7H_2O$	Gor'kaya sol' (Bitter salt, magnesium sulphate, epsom salt, Sernokislyi magnii).

The adjective, *dvoinoi* (double, binary), may be used in referring to double salts.

$FeSO_4 \cdot (NH_4)_2 SO_4 \cdot 6H_2O$	Dvoinaya sernozhelezistoammonievaya sol'
$UO_2(C_2H_3O_2)_2 \cdot 2NaC_2H_3O_2$	Dvoinaya sol' uksusnokislogo uranila i uksusno kislogo natriya.

The following names of the acids and their salts illustrate how the Russians combined Russian and foreign roots in the same word.

Na_3SbS_3	Tiosur'myanistokislyi natrii, sul'fosurmyanistokislyi natrii
Na_2SnS_3	Tioolovyamnokislyi natrii, sul'foolovyannokislyi natrii,

The names of the following compounds are closely related to the names of component elements and radicals.

Khlorokis' fosfora	$POCl_3$	Phosphorus oxychloride
Khlorokis' khroma	CrO_2Cl_2	Chromyl chloride
Amid natriya	$NaNH_2$	Sodium amide (sodamide).

Special attention must be given to adjectives derived from nouns denoting electronegative elements. Such adjectives require different translations depending on the noun, which they modify.

For example, the adjective, khlornyi, cannot be translated by any single English word. This is true of other, similarly derived adjectives, as is illustrated by the following examples.

Khlor*ist*aya med'	CuCl	cupr*ous* chloride
Khor*n*aya med'	$CuCl_2$	Cupr*ic* chloride
Sern*ist*aya kislota	H_2SO_3	Sulphur*ous* acid
Ser*n*aya kislota	H_2SO_4	Sulphur*ic* acid.

These examples also illustrate the fact that certain adjectives with suffix -ist-, for example khloristyi, may be used (I) to name a salt containing a metal, *e.g.*, Cu, in a lower valence state, as in CuCl, or (2) to name salts of metals existing in only one valence state, *e.g.*, Al. However, adjectives formed with the -ist- suffix may be used sometimes in naming a salt containing a metal in its higher valence state, provided the higher valence state is thought of as being the more common or usual valence state of the metal when functioning as a cation in salts. A similar irregularity in usage occurs when *okis'* is used, without further qualification, in naming the lower member of a pair of salt-forming, metal oxides. The following examples are typical.

Iodistaya rtuti	HgI_2	Mercurous iodide
Khloristaya med'	$CuCl_2$	Cuprous chloride
Sernistaya rtut'	HgS	Mercuric sulphide.

5. Nomenclature in Indian language

The terminology discussed earlier is not confined to chemistry alone but can be extended to other subjects as well.

Even in non-technical literature in Indian languages, the Sanskrit words "tapa" and "ushnata" (or ushna) have clearly defined meanings, heat and hotness respectively, the former being the cause and the latter being the effect. It is not clear how the term heat is termed as *ushna* and the temperature as *tapa*, thereby interchanging the *cause* and *effect.*

In coining new Indian words, the most effective is the suffixal method of word-building. Prefixal translations could also be used. The foreign loan words in Indian languages last long since they are primarily universal terms, widely known in many languages.

It should be possible also to weave a pattern of association to assist the human memory in acquiring and retaining a vocabulary of Indian words. Large number of Indian words can be derived from simple words and roots by prefixing and suffixing. Other words can be formed by compounding two or three words which are called "samasa". The root, a monosyllabic, has a meaning which is characteristic of the group of Indian words that contain it. Knowledge of the root is the key to the meaning of a word or group of words and it also fixes the word in the memory and dictionary search time is economised. Skill in resolving compound and complex words depends largely on their recognition of combining forms and joining units. By recognising the known forms, the unknown remainder can be isolated and looked up in a dictionary. Skill in resolving compound words into their component parts often gives the technological and terminological meaning.

In case the element shows the same valency but a molecule of anhydride is combined with different amounts of water molecules, a number of acids are formed. The words orto-, pyro-, and meta- are prefixed. In cases where several atoms of metalloid are present in a molecule of acid, the Greek names of the numeration mono-, di-, tri-, tetra, are added as prefixes for the name of the acids. It is advisable to retain such prefixes in Indian languages as they have meaning in the language of chemistry.

It should not merely be the substitution of English terms with Indian ones. Russians use two nouns such as " postoyannaya skorosti ", the actual meaning conveyed by them being " constant of velocity "[5] which is more understandable. In referring to mercury, mercurous, mercuric, etc., we need not be guided by the sound of the ending. This is what is exactly being done in Indian languages. For example, in Tamil language, the terms used for this particular term are respectively padar*asam*, padar*asa*, padar*ika*. There is no necessity to use two different terms for the same term " acid " as is being done in Tamil. They use the terms " amilam " and " kadi " for the term " acid ". Why is H_2SO_4 named as " gandh*aga* amilam " and H_2SO_3 as sulphur*ous* amilam ?

The word " wheel " is translated as " uruli " and " chakram " in the district of Madras and north of it, whereas the term is referred to as " paida ", in districts south of Madras. The terms " circle " is referred to in Tamil as " suzharchi " and " suzhal nigazhchi ". Why should not the same term be referred to as " kalavattam " ? The term " period " can be referred to as " kalakkuru " and this term need not be translated as " adirvu kalam " which is unnecessary. With which Tamil term can the English term " fequency " be equated? Is it " adirvuyen " or " oosalyen " or " adukku viraivu ", or " alaisidarvu "? Is it possible to name the term " periodic motion " in Tamil as " seerkala asaivu " and " harmonic motion " as " seerasaivu " and " simple harmonic motion " as " yeliya seerasaivu " ? By which Tamil term can one designate the term " acceleration " ? Is it by " mudukkam " or by " viraivu " ? Can we name the term " mode of vibration " in Tamil as " adirvukalin pangu " and the " fundamental mode " as " adippadai pangu " ? These are some of the doubts which naturally arise in the minds of those who coin equivalents for Indian languages.

Caution is necessary in coining of words in Indian languages. In Tamil, the technical word " Poriyiyal " has been coined as equivalent of " Engine ". But the word " Engineer " is born out from the word " ingenuity ". Actually the word " Poriyiyal " should be given the label " mechanical " and " Engineering " should be translated as " Scoozhchiyam ". The logic behind this suggestion is that this word is born out of a profession and not on the basic material basis. If the word is coined from material basis, it should be named after the meaning of " creation ", " formation ", etc. Since the words have already been coined, it is not possible to change them now. There are many instances where the words coined in the same language differ from district to district even in the same state. Such haphazard coining of words will lead to confusion in getting the meaning later and also in building up new word structures.

6. Conclusion

As the number of chemical compounds known today is put by some authorities around 2·25 millions, it would be difficult to attempt compiling a comprehensive terminology.

To ensure maximum accuracy and reliability, exacting research should be done on modern and reliable primary sources. A detailed attempt is made in this paper (see pp. 123-130 of section 4). It has become necessary to adhere to certain specific procedure for the sake of consistency as shown in section 4. The procedure outlined therein can be conveniently used to suit Indian languages.

Use of typically indian suffixes to convert words of foreign origin particularly nouns into adjectives should be handled with special care (see examples given under sections 4 and 5). Care should be taken to avoid using one noun to modify another as is done in English expression " glass rod ", " salt solution ", " velocity constant ". The reason for this is explained in sections 4 and 5.

At times a foreign term may be more expressive in preference to an already existing Indian term. Compound words may also be formed by combining a word of foreign origin with an Indian word, for example, biprism, orto-, pyro-, meta-, acids, etc. Although distressing to purists, such compound words are not particularly difficult to understand. It is very difficult to become familiar with fine shades of meaning unless one learns to connect Indian words directly with objects, concepts, actions and emotions rather than with English words.

The benefits to be derived from an understanding of Russian word-building procedures are well worth the effort required to overcome the initial difficulties. German and English are not as highly inflexual as Russian language. Russian is therefore suited to Indian languages for adoption. Difficulties encountered in the translation of technical terms in German *vis-a-vis* English are much more than in Russian language. The term " Leistung " is a good illustration. Its basic meaning is capacity or power. In English different words which basically have the same meaning are used differently. For example :

Schmelz*leistung* = Melting *efficiency*

Studen*leistung* = Hourly *output*

Die *Leistung* eines Menschen = *Efficiency* of a person.

The term " Gehalt " is another illustration to show how the meanings vary:

Der *Gehalt* an Beimengungen ist hoch = The admixture *content* is high

Eine Losung von hoheren *Gehalt* = A solution of higher *concentration.*

Ein Gefass mit einem *Gehalt* von zehn Litern = A vessel with a *capacity* of 10 litres.

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