European International Journal of Philological Sciences (ISSN: 2751-1715)

Received: 14 April 2026 | Accepted: 02 May 2026 | Published: 29 May 2026

DOI: 10.55640/eijps-06-05-14

RESEARCH ARTICLE

Comparative Analysis of Lexical-Semantic Features of Chemical and Physical Terminology in Uzbek And English

Qayumova Mohichehra Abduxalim qizi
Teacher of Karshi State University, Uzbekistan

VOLUME: Vol.06 Issue05 2026

PAGE: 68-72

Abstract

This article investigates the lexical-semantic characteristics of chemical and physical terminology in Uzbek and English. The study focuses on semantic structure, monosemy, polysemy, synonymy, borrowing processes, and conceptual features of scientific terms. Comparative analysis demonstrates that both languages possess common international scientific elements while preserving their own linguistic characteristics. The article also discusses the influence of English as the global language of science on the development of Uzbek scientific terminology. The research is based on comparative, descriptive, and semantic analysis methods and emphasizes the importance of terminology in scientific communication and linguistic development.

KEYWORDS

Terminology, chemistry terminology, physics terminology, lexical semantics, comparative linguistics, monosemy, polysemy, scientific discourse.

INTRODUCTION

The development of science and technology has significantly accelerated the growth of scientific terminology in modern languages. Chemistry and physics are among the most important branches of science, and their terminological systems reflect scientific concepts, laws, processes, and discoveries. Scientific terminology serves not only as a linguistic phenomenon but also as a means of preserving and transmitting scientific knowledge across cultures and generations.

According to Eugen Wüster, terminology represents a systematic organization of concepts within specialized fields of knowledge. He emphasized that scientific terms must be standardized, accurate, and semantically stable. Similarly, Maria Teresa Cabré argued that terminology combines linguistic, communicative, and cognitive dimensions of scientific knowledge. The lexical-semantic analysis of terminology is especially important because it reveals semantic relations such as monosemy, polysemy, synonymy, antonymy, and metaphorical extension. Modern scientific communication increasingly depends on international terminology, especially English scientific vocabulary, which has become dominant in global academic discourse.

The Uzbek scientific lexicon has also developed intensively through borrowing, semantic adaptation, and internal word formation. Consequently, comparative analysis of English and Uzbek chemical and physical terminology allows researchers to identify similarities and differences in semantic organization and conceptual representation.

METHODS

The research employed comparative, descriptive, semantic, contextual, and etymological analysis methods. More than two hundred chemical and physical terms in English and Uzbek were selected from scientific dictionaries, encyclopedias,

textbooks, and academic articles. The study materials were collected from the Oxford English Dictionary, O‘zbek tilining izohli lug‘ati, Fanlar terminlarining izohli lug‘ati, and linguistic works devoted to terminology studies.

Comparative analysis was used to determine similarities and distinctions between English and Uzbek scientific terminology. Semantic analysis helped identify monosemantic and polysemantic properties of terms. Contextual analysis revealed the functional use of terminology in scientific discourse, while etymological analysis was used to trace the origins of borrowed terms.

RESULTS AND DISCUSSION

The research demonstrates that chemical and physical terminology in Uzbek and English possesses common international characteristics while preserving language-specific lexical and semantic features.

Table 1. Common international chemical terms

English Term	Uzbek Equivalent	Origin
atom	atom	Greek
molecule	molekula	Latin
catalyst	katalizator	Greek
polymer	polimer	Greek
electron	elektron	Greek

The table illustrates the strong internationalization of chemical terminology. Most scientific terms retain similar phonetic and semantic forms across languages because they originate from classical Greek and Latin roots. Scientific terminology is generally characterized by monosemy because scientific discourse requires precision and clarity.

Table 2. Examples of monosemantic terms

Term	Field	Meaning
neutron	Physics	Neutral subatomic particle
isotope	Chemistry	Variant of a chemical element
proton	Physics	Positively charged particle
catalyst	Chemistry	Substance accelerating reaction

However, some scientific terms gradually develop polysemantic meanings through interdisciplinary communication and metaphorical extension.

Table 3. Polysemantic scientific terms

Term	Scientific Meaning	General Meaning
field	Force region	Open area
current	Electric flow	Present time
charge	Electrical property	Payment/responsibility
solution	Chemical mixture	Answer

The phenomenon of polysemy reflects the interaction between scientific and everyday language. In Uzbek terminology, similar semantic shifts can also be observed in terms such as "maydon," "tok," and "eritma."

$$E = mc^2$$

The famous equation above represents one of the most internationally recognized physical formulas and demonstrates the universality of scientific symbolic language. According to George Lakoff and Mark Johnson, metaphor is fundamental to scientific cognition. Many physical terms are metaphorically motivated and derived from everyday experience.

Diagram 1. Metaphorical Development of Physical Terms

Everyday Experience

↓

Physical Observation

↓

Conceptual Metaphor

↓

Scientific Term

↓

Standardized Terminology

For example, electric current → flowing water metaphor, wave → sea wave metaphor, field → spatial territory metaphor.

These conceptual metaphors help explain abstract scientific concepts through familiar human experiences. The study also revealed the active influence of English on Uzbek scientific terminology. Many modern scientific terms enter Uzbek either directly from English or indirectly through Russian.

Table 4. Borrowing and adaptation processes

English Form	Uzbek Adaptation	Adaptation Type
energy	energiya	Phonetic adaptation
reaction	reaksiya	Morphological adaptation
molecule	molekula	Direct borrowing
acceleration	tezlanish	Semantic translation

The table demonstrates that Uzbek terminology combines both international borrowings and native lexical formations.

David Crystal notes that scientific vocabulary evolves rapidly under globalization and technological progress. This tendency is particularly visible in modern chemistry and physics where new branches constantly produce new terminology.

$$PV = nRT$$

Scientific formulas such as the ideal gas equation above also function as universal international symbols independent of linguistic boundaries.

Another important lexical-semantic feature observed during the research is synonymy. Uzbek scientific discourse often contains both borrowed international terms and native equivalents.

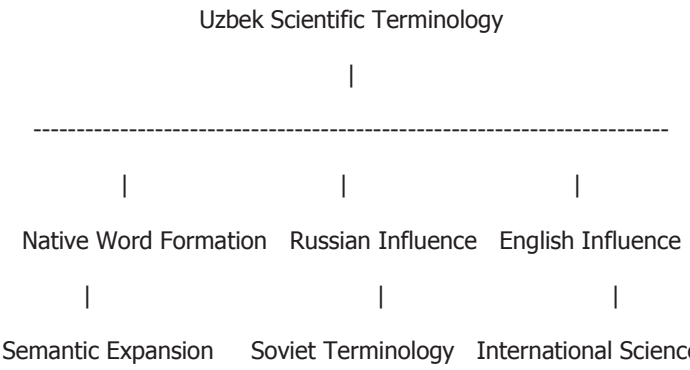
Table 5. Synonymic relations in uzbek terminology

International Term	Native Uzbek Equivalent

temperatura	harorat
vibratsiya	tebranish
oksidlanish	kislorod bilan birikish
deformatsiya	shakl o‘zgarishi

The coexistence of synonymous forms reflects the ongoing development and standardization of Uzbek scientific terminology.

Diagram 2. Sources of uzbek scientific terminology



The diagram illustrates the complex historical development of Uzbek scientific vocabulary. The analysis also indicates that English terminology generally tends toward shorter and more internationally standardized forms, while Uzbek terminology demonstrates stronger morphological adaptation through suffixation and semantic translation.

CONCLUSION

The comparative analysis of lexical-semantic features of chemical and physical terminology in Uzbek and English demonstrates that scientific terminology constitutes a highly organized and dynamic lexical system. Both languages share numerous international scientific elements while preserving their own linguistic and semantic characteristics. The study confirms that monosemantic terms dominate scientific discourse because precision and conceptual clarity are essential for scientific communication. Nevertheless, interdisciplinary interaction and metaphorical extension contribute to the development of polysemantic meanings in certain terms.

The research also reveals the significant influence of English as the global language of science on Uzbek scientific terminology. Borrowing, semantic adaptation, and internationalization remain the principal mechanisms of terminology formation and development. Furthermore, metaphorical conceptualization plays an important role in the formation of physical terminology, helping explain abstract scientific phenomena through familiar experiential models.

Scientific terminology continues to evolve together with scientific and technological progress. Therefore, comparative lexical-semantic studies contribute not only to terminology science but also to cognitive linguistics, translation studies, scientific discourse analysis, and intercultural communication research. Future research may focus on corpus-based terminology analysis, artificial intelligence in terminology standardization, and multilingual scientific communication.

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