O‘zbekiston Respublikasi Oliy ta’lim, fan va innovatsiyalar vazirligi

Toshkent kimyo-texnologiya instituti

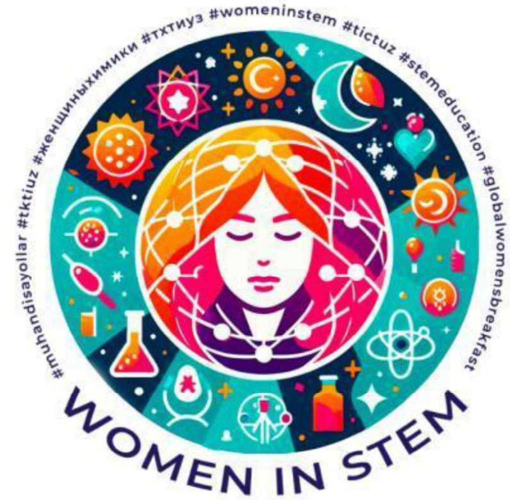
“O‘zkimyosanoat” Aksiyadorlik Jamiyati

O‘zbekiston Respublikasi Oila va xotin-qizlar qo‘mitasi

Oila va gender ilmiy-tadqiqot instituti

Integral Universiteti (Hindiston)

“Neofit Rilski” Janubiy-G’arbiy Universiteti (Bolgariya)



“WOMEN IN STEM”

XALQARO FORUM
ILMIY ISHLAR TO‘PLAMI

BOOK OF PROCEEDINGS

TOSHKENT, 2026-yil, 14-17-FEVRAL

“Women in STEM-2026” ilmiy haftaligi “Innovator ayollar: Ko‘plab ovoz — bitta kelajak” xalqaro ilmiy forumi materiallari. Maqolalar to‘plami. –Toshkent, TKTI, 2026, 572 b. https://doi.org/10.5281/zenodo.18826650

Ushbu to‘plam “11-fevral – BMTning fandagi ayol va qizlar xalqaro kuni” nishonlash doirasida Toshkent kimyo-texnologiya instituti tomonidan 2026 yil 14-17 fevral kunlari tashkil etilgan “Women in STEM-2026” ilmiy haftaligi va “Innovator ayollar: Ko‘plab ovoz — bitta kelajak” mavzusidagi xalqaro ilmiy forumi materiallaridan tashkil topgan.

To‘plam materiallaridan mutaxassis, o‘qituvchi, tadqiqotchi hamda magistratura va bakalavriat talabari foydalanishi mumkin.

Tezislarni to‘plash va nashr etish uchun mas’ul:

Umarova V., PhD, dots.

Maqolalar mualliflari taqdim etilgan ma'lumotlar, tadqiqot natijalari haqqoniyligi va iqtiboslar to‘g’riligi uchun mas’ul hisoblanadi.

Book of proceedings of the “Women in STEM-2026” science week and international scientific forum “Women-Innovators: Many voices — one future”. Book of proceedings. – Tashkent, TICT, 2026, 572 p. Published online: https://doi.org/10.5281/zenodo.18826650

This collection consists of materials of the international scientific forum “Women-Innovators: Many voices — one future”, organized by the Tashkent Institute of Chemical Technology on February 14-17, 2026, within the framework of scientific week “Women in STEM-2026” and celebration of United Nations “February 11 - International Day of Women and Girls in Science”.

The Book of proceedings can be used by specialists, teachers, researchers, as well as master's and bachelor's degree students.

Responsible for the collection and publication of Book of proceedings:

Vasila Umarova, PhD, Assoc. Prof.

The authors of the articles are responsible for the accuracy of the information provided, the reliability of the research results, and the correctness of the citations.

“Women in STEM-2026” ilmiy haftaligi, “Innovator ayollar: Koʻplab ovoz — bitta kelajak” ilmiy forumi, Toshkent kimyo-texnologiya instituti yosh olimlari va talabalari ishtirokida “Kelajak STEM yulduzlari” davra suhbati BMT tomonidan 2015-yilda e’lon qilingan “11-fevral – Fanda ayollar va qizlarning xalqaro kuni”ni nishonlash doirasida tashkil etilgan. Tadbirlar IUPAC xalqaro tadbirlar roʻyxatiga kiritilgan: *https://iupac.org/gwb/2026/women-innovators-many-voices-one-future/*

The “Women in STEM-2026” scientific week, the “Women Innovators: Many Voices — One Future” scientific forum, and the “Rising STEM Stars” roundtable with the participation of young scientists and students of the Tashkent Institute of Chemical Technology are organized as part of the celebration of “**February 11 - International Day of Women and Girls in Science**” proclaimed by the UN in 2015. The events are included in the IUPAC list of international events: *https://iupac.org/gwb/2026/women-innovators-many-voices-one-future/*

Научная неделя «Women in STEM-2026», научный международный форум «Много голосов — одно будущее» и круглый стол «Будущие звезды STEM» организованы в рамках празднования «**11 февраля – Международного дня женщин и девочек в науке**», объявленного ООН в 2015 году. Мероприятия включены в список международных мероприятий IUPAC: *https://iupac.org/gwb/2026/women-innovators-many-voices-one-future/*

ORGANIZERS OF “WOMEN IN STEM-2026” SCIENTIFIC WEEK:

 https://doi.org/10.5281/zenodo.18826650

- Ministry of Higher Education, Science and Innovations of the Republic of Uzbekistan;
- Tashkent Institute of Chemical Technology;
- Joint - Stock Company "Uzkimyosanoat" ;
- Family and Women's Committee;
- Chirchik chemical -industrial technopark ;
- "Ziyo Forum" Foundation for the Development of Science and Education;
- Joint - Stock Company "Maxam-Chirchik ";
- Research Institute "Family and Gender".

INTERNATIONAL ORGANIZATIONS:

- Integral University (India)
- South-West University Neofit Rilski (Bulgaria)
- International Union of Pure and Applied Chemistry (IUPAC)

SESSIONS:

Session 1. "Green Horizons: Innovation and Sustainable Development in Science" (chemistry and chemical technology, food technology and safety, biotechnology, oil and gas processing, energy, astronomy, geology, mathematics, physics, computer science, robotics and IT, engineering).

Session 2. "Nexus Impact: Shaping a Responsible Worldview" (history, sociology, political science, philosophy, economics, pedagogy) **.**

Session 3. "Women Engineers: Designing a Bright Future" (women's contribution to the development of engineering and technology, education, pedagogy, psychology, and philosophy).

Address and contacts of the organizing committee: 100011, Tashkent city, A.Navoiy street, 32. Tashkent Institute of Chemical Technology.

Scientific Secretary of the Conference: Vasila Umarova, tel. +998 97 431-89-77 (Telegram), **tkti.conference@gmail.com**

Conference materials will be posted on the official website of TKTI: https://tkti.uz/research/conference

INNER TRANSITION ELEMENT BASED NANOMATERIALS

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Abstract
Nanomaterials based on inner transition elements, especially those made from lanthanides and actinides, have remarkable physicochemical characteristics that allow for multipurpose integration in energy, sensing, and medicinal applications. Recent research emphasizes how their distinct optical stability, narrow emission bands, and adjustable near-infrared luminescence enable enhanced sensing modalities, photothermal therapy, and deep-tissue bioimaging. Furthermore, hybrid nanostructures and metal–organic frameworks based on lanthanides provide a variety of platforms for sustainable technologies, environmental monitoring, and catalysis. This review highlights some current research on inner transition element-based nanomaterials made using diverse techniques that have been used in a variety of applications.
Keywords: Lanthanides, Actinides, Nanomaterials

INTRODUCTION

The shielding 4f electron configurations and controllable energy transitions of inner transition element-based nanomaterials, especially lanthanide-doped nanocomposites, give them unique optical, electrical, and catalytic capabilities. Strong upconversion luminescence and customized emission profiles are demonstrated by lanthanide-doped upconversion nanocomposites for example $NaYF_4$:Yb^{3+}/Er^{3+} coupled with functional matrices, which are advantageous in bioimaging, sensing, and photonic applications [1]. In polymer matrices, lanthanide-polymer hybrid composites that contain Eu^{3+} and Tb^{3+} complexes exhibit distinctive red and green emission, demonstrating how polymer nanocomposites can be designed with adjustable luminous characteristics [2]. Temperature-dependent emission intensities suitable for smart imaging probes are exhibited by stimuli-responsive lanthanide nanocomposites, such as thermo-activatable upconversion particles coated with copolymer shells [3]. These nanocomposite systems enhance stability, adaptability, and multifunctionality in biological diagnostics, environmental monitoring, and optoelectronics by combining the benefits of inner transition element luminescence with host matrices. In this paper, we have reported the recent studies of inner transition-based nanocomposites and their applications across various fields.

DIIFFERENT ROUTES OF FABRICATION

Inner transition element-based nanocomposites, particularly lanthanide-doped systems, are commonly fabricated using self-assembly, in-situ growth, and epitaxial core–shell strategies. Self-assembly enables the integration of pre-synthesized lanthanide nanoparticles with matrices such as metal–organic frameworks or carbon-based materials, while in-situ growth improves interfacial contact and composite stability. Epitaxial growth of core–shell heterostructures can be utilized to regulate energy transfer pathways and optimize the optical performance of lanthanide-based nanocomposites [1].

LITERATURE REVIEW ON INNER TRANSITION ELEMENT BASED NANOMATERIALS

Inner transition element-based nanomaterials find applications in several industries. Some studies on inner transition element-based nanocomposites are presented in Table 1.

Table 1. Studies on inner transition element based nanomaterials

S.No.	Nanocomposite	Application Studied	Reference

1	*$Nd_2Mo_3O_{12}$/RGO*	*Electrochemical sensing of carcinogenic pollutant Metol*	[4]
2	*Ce_2S_3@CNS*	*Electrochemical sensing of antibacterial drug sulfaguanidine in biological systems*	[5]
3	*$Yb_2O_3/ZnFe_2O_4$*	*Photocatalysis of Brilliant Blue FCF dye and Glyphosate and electrochemical sensing of catechol*	[6]
4	*Boron-g-C_3N_4-Pr_6O_{11}*	*Colorimetric detection of Hg^{2+} ion and solar photocatalytic removal of toxic water pollutants*	[7]

CONCLUSION

Since inner transition elements, especially lanthanides, have special optical, electrical, and redox properties, their nanocomposites are ideal for use in energy conversion, chemical sensing, and environmental remediation. In energy-related systems, lanthanide inclusion has been reported to improve photocatalytic pollutant degradation, increase sensing sensitivity through sharp emission bands, and promote effective charge transfer. As a result, inner transition element-based nanocomposites have shown themselves to be extremely effective multifunctional materials for use in sensing, environmental, and sustainable energy applications.

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