ISSN: 2181-3906 2025

International scientific journal
«MODERN SCIENCE AND RESEARCH»
VOLUME 4 / ISSUE 1 / UIF:8.2 / MODERNSCIENCE.UZ

OLTINGUGURTNING FUNKSIONAL JIHATLARI VA ALLATROPIK SHAKL O`ZGARISHINING METODOLOGIK ASOSLARI

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https://doi.org/10.5281/zenodo.14739978

Anotatsiya. *Ushbu maqolada oltingugurtning funksional jihatlari va uning allotropik shakllarining o'zgarishining metodologik asoslari tahlil qilinadi. Oltingugurt tabiatda turli allotropik shakllarda mavjud bo'lib, ularning har biri o'ziga xos fizik va kimyoviy xususiyatlarga ega. Bunda ilmiy-metodologik yondashuvlar, jumladan eksperimental, nazariy va fizik-kimyoviy usullar o'rganiladi. Oltingugurtning allotropik shakllarining o'zgarishi va uning kimyoviy reaktivligi, o'zaro bog'lanishlari va boshqa xususiyatlari sanoat, farmatsevtika va ekologiya kabi sohalarda qo'llanilishi muhim ekanligi ko'rsatilgan. Oltingugurt bu o`rganishi kerak bo`lgan muhim mavzulardan biridir. Chunki alkimyogarlar davridanoq chuqur sir – sanoatlarga bo`lgan falsafa toshining asosi hisoblangan. Oltingugurt bugungi kunda ko`pgina jabhalarda ishlatiluvchi va foydali modda hisoblanadi. Uning allatropik shakl o`zgarishi va buning natijasida har xil xossalarni nomoyon etishini o`rganish maqolamizning asosiy maqsadi hisoblanadi.*

Oltingugurtning funksional xususiyatlari, tirik va o`simlik organizmlarida qanday vazifalarni bajarishi maqolada bayon etiladi.

Kalit so`zlar: *Oltingugurt, allatropiya, fizik – kimyoviy taxlil, ilmiy -metodologik taxlil, betta – oltingugurt (β-S), alfa – oltingugurt (α-S), kompyuter simulyatsiyalari, faza diagrammasi, ekspirement.*

FUNCTIONAL ASPECTS OF SULFUR AND METHODOLOGICAL BASIS OF ALLOTROPIC TRANSFORMATION

Abstract. *This article analyzes the functional aspects of sulfur and the methodological basis of the transformation of its allotropic forms. Sulfur exists in nature in various allotropic forms, each of which has its own physical and chemical properties. Scientific and methodological approaches, including experimental, theoretical and physicochemical methods, are studied. It is shown that the transformation of allotropic forms of sulfur and its chemical reactivity, interconnections and other properties are important for application in such fields as industry, pharmacy and ecology. Sulfur is one of the important topics that need to be studied. Because since the time of alchemists, it has been considered a deep secret - the basis of the philosopher's stone for industries. Today, sulfur is a substance used and useful in many areas. The main purpose of our article is to study its allotropic transformation and the manifestation of various properties as a result. The functional properties of sulfur, what tasks it performs in living and plant organisms are described in the article.*

Keywords: *Sulfur, allatropy, physical-chemical analysis, scientific-methodological analysis, beta-sulfur (β-S), alpha-sulfur (α-S), computer simulations, phase diagram, experiment.*

ФУНКЦИОНАЛЬНЫЕ АСПЕКТЫ СЕРЫ И МЕТОДОЛОГИЧЕСКИЕ ОСНОВЫ АЛЛОТРОПНЫХ ПРЕВРАЩЕНИЙ

Аннотация. *В статье анализируются функциональные аспекты серы и методологические основы преобразования ее аллотропных форм. Сера существует в природе в различных аллотропных формах, каждая из которых обладает своими уникальными физическими и химическими свойствами. Это предполагает изучение научных и методологических подходов, включая экспериментальные, теоретические и физико-химические методы. Было показано, что разнообразие аллотропных форм серы, ее химическая активность, сшивание и другие свойства важны для применения в таких областях, как промышленность, фармацевтика и экология. Сера — одна из важных тем для изучения. Потому что со времен алхимиков в основе философского камня для промышленности лежала глубокая тайна. Сера — полезное вещество, используемое сегодня во многих областях. Основной целью нашей статьи является изучение изменения*

его аллотропной формы и связанного с этим проявления различных свойств. В статье описаны функциональные свойства серы и задачи, которые она выполняет в живых и растительных организмах.

Ключевые слова: *Сера, аллатропия, физико-химический анализ, научно-методический анализ, бета-сера (β-S), альфа-сера (α-S), компьютерное моделирование, фазовая диаграмма, эксперимент.*

Kirish

Oltingugurt (S) — tabiatda keng tarqalgan kimyoviy element bo'lib, o'zining turli allotropik shakllari va o'ziga xos kimyoviy xususiyatlari bilan ajralib turadi. Bu element o'zining ko'plab turlari va shakllari orqali turli sohalarda qo'llaniladi, jumladan, sanoat, farmatsevtika va energetika sohalarida. Oltingugurtning allotropik shakllarining o'zgarishi va ularning funksional xususiyatlari tabiiy jarayonlarni yaxshiroq tushunish uchun muhim ahamiyatga ega. Ushbu maqolada oltingugurtning asosiy funksional jihatlari, allotropik shakllarining o'zgarishi va bularni ilmiy-metodologik asoslari batafsil tahlil qilinadi.

Metodologik asoslar

Oltingugurtning allotropik shakllarining o'zgarishi va funksional xususiyatlarini o'rganishda bir nechta ilmiy metodologiyalar qo'llaniladi. Bular orasida eksperimental metodlar, nazariy modellash, va fizik-kimyoviy tahlil usullari eng muhim o'rin egallaydi. Eksperimental usullar yordamida oltingugurtning turli shakllari o'zgartirilishi va ular bilan bog'liq xususiyatlar o'rganiladi. Nazariy metodlar esa oltingugurtning kimyoviy reaksiyalarini va uning allotropik shakllarining o'zgarishini tahlillash imkonini beradi.

Oltingugurtning allotropik shakllari va ularning o'zgarishining metodologik asoslari, avvalo, atomlar va molekulalar o'rtasidagi kuchlar, kristall tuzilmalari, termodinamikaviy jarayonlar va mexanik xususiyatlar bilan bog'liq. Shuningdek, bu jarayonlar kimyoviy reaksiyalar va reaksiya kinetikasining tahlili orqali chuqur o'rganiladi.

Oltingugurtning allotropik shakllari

Oltingugurt tabiatda bir nechta allotropik shaklga ega bo'lib, ular o'rtasida sezilarli fizik va kimyoviy farqlar mavjud. Eng mashhur shakllariga alfa-oltingugurt (S_8), beta-oltingugurt va amorf oltingugurt kiradi. Alfa-oltingugurt (S_8) – bu oltingugurtning eng barqaror va keng tarqalgan shaklidir. U sakkiz atomli halqali molekulalardan tashkil topgan kristall tuzilmani hosil qiladi. Boshqa allotropik shakllar esa turli temperaturada yoki bosimda hosil bo'ladi.

ISSN: 2181-3906 2025

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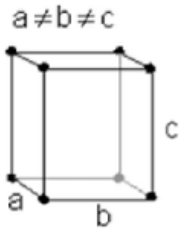
Oltingugurtning boshqa allotropik shakllari, masalan, S_6, S_4 va amorf shakllar, maxsus sharoitlarda, jumladan, yuqori bosim va yuqori haroratda hosil bo'lishi mumkin. Bu shakllarning har biri o'ziga xos fizika-kimyoviy xususiyatlarga ega, masalan, ularning solubility (eritiluvchanlik) darajasi, kimyoviy reaktivligi, elektr va issiqlik o'tkazuvchanligi farqlanadi.[6,7]

Oltingugurtning funksional jihatlari

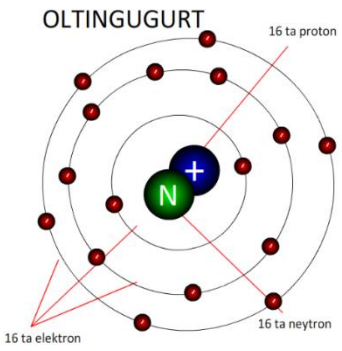
Oltingugurt haqida qisqacha: Oltingugurt davriy sistemaning VI A guruh III davrida joylashgan tartib raqami 16, atom massasi 32.066 g/mol. Agregat holati asosan qattiq holda. Rangi sariq bo`lgan metalmaslar olilasiga mansub. Elektromanfiyligi 2.5 ga teng. Qaynash temperaturasi 717.80 K yoki 444.70 C, erish temperaturasi 388.30K yoki 115.21C ni tashkil etadi. Zichligi 2.08 g/sm$^3$ bo`lib, kristal panjar tuzilishi quyidagicha:



Kristall panjarasi

Atom tuzilishiga ko`ra 16 ta praton, elektron va neytronlari mavjud.

O`zining asosiy oksidlarida asosan +4,+6 ($SO_2$, $SO_3$) oksidlanish darajalarini nomoyon etadi. Tashqi energetik qavatida 4 ta elekton bo`lgani va ns^2np^4 umumiy elektron konfiguratsiyasi sababli IV va VI valentlikni nomoyon etadi.



Oltingugurtning funksional jihatlari uning kimyoviy reaktivligi, o'ziga xos bog'lanishlari, va elektr va issiqlik o'tkazuvchanlik xususiyatlariga asoslanadi.[5] Oltingugurt o'zining asosiy kimyoviy reaksiyalarida ko'pincha oksidlanish-reduksiyalash jarayonlarida ishtirok etadi, shuningdek, u turli o'simlik va hayvonot dunyosining biologik jarayonlarida ham muhim rol o'ynaydi.[3]


Tioga tabiiy gaz koni (Shimoliy Dakota, AQSh) yaqinida topilgan oltingugurt bo'lagi.

Oltingugurt turli sulfidlar, masalan, natriy sulfid (Na_2S) yoki mis sulfid (CuS) shaklida tabiiy va sanoat sharoitida mavjud. Bu sulfidlar ko'plab sanoat jarayonlarida, masalan, metallurgiya va keramikada qo'llaniladi. Shuningdek, oltingugurt turli xil farmatsevtik preparatlarda, shu jumladan antibiotiklar va antibakterial dorilarda, antiseptik sifatida ishlatiladi.[8,9,10] Oltingugurtning allotropik shakllari orasidagi o'zgarishlar, asosan, harorat, bosim va molekulyar tuzilma o'zgarishi bilan bog'liq. Shu nuqtada, materialshunoslik, kimyo va fizika sohalarining yondashuvlari qo'llaniladi.

ISSN:
2181-3906
2025

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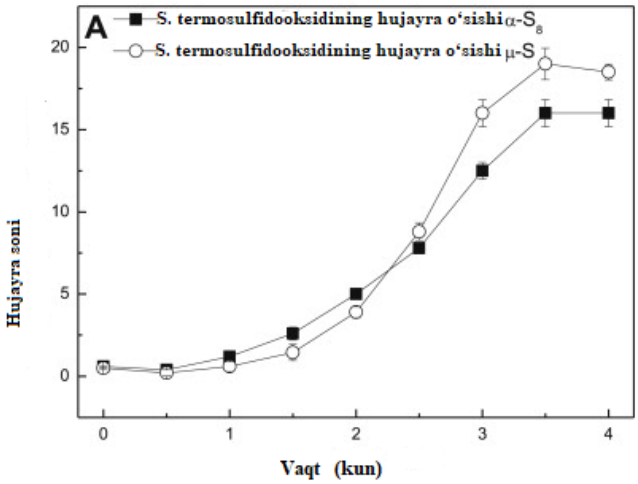
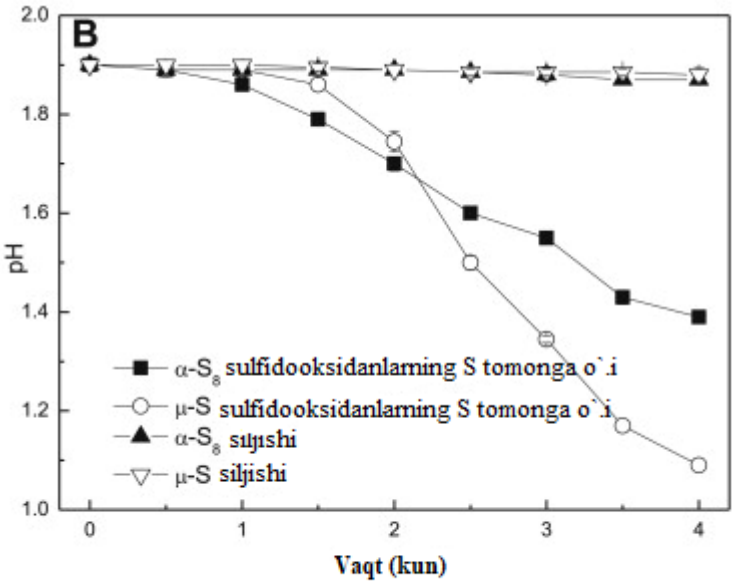
Shunday qilib, oltingugurtning allotropik shakl o'zgarishlarini o'rganish uchun tajribalar o'tkazish, termodinamikani hisoblash, molekulyar modellash va kompyuter simulyatsiyalari metodlari keng qo'llaniladi. (1 – rasm.)



1 - rasm. a-S8 va β-S da yetishtirilgan S. termosulfidooksidlarining hujayra o'sishi va oltingugurt oksidlanishi.



2 - rasm. S. termosulfidooksidanlarning oltingugurt oksidlanishi pH egri chiziqlari

Oltingugurtning allotropik shakllarining o'zgarishi tahlil qilinayotganda, molekulalarning kristall tuzilmasidagi o'zgarishlar, energetik farqlar va fazaviy o'zgarishlar hamda faza diagrammasining o'rganilishi muhim ahamiyatga ega. Buning natijasida oltingugurtning turli allotropik shakllarining qanday sharoitlarda o'zgarishi va ular orasidagi transformatsiyalarni prognoz qilish imkoniyati tug'iladi.[11,12,13]

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International scientific journal
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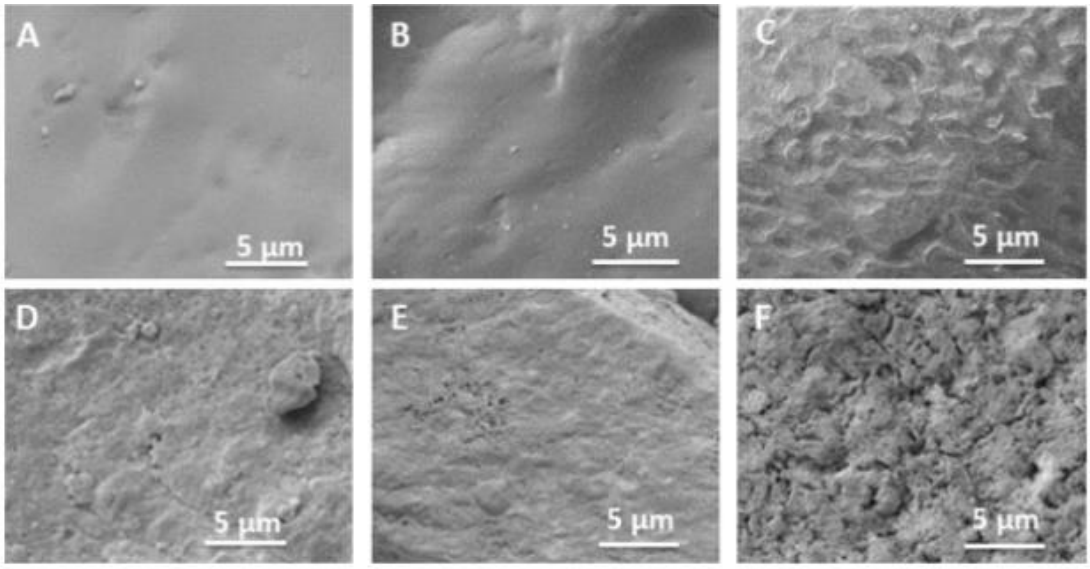

3 - rasm. S. thermosulfidooxidans o'sishidan oldin va keyin a-S 8 (A-C) va β-S (D-F) ning sirt morfologiyasi . (A): Standart a-S 8 ; (B): a-S 8 tomon nazoratda; (C): S. thermosulfidooxidans o'sishidan keyin a-S 8 ; (D): Standart β-S; (E): β-S tomon nazoratda; (F): S. termosulfidooksidanlarning o'sishidan keyin β-S .

Yuqorida ifodalangan rasmlar bo`yicha oltingugurtning temperatura natijasida o`z allatropik shakl o`zgarishlarining hosil bo`lishi ifodalangan .[1,2,4]

Eksperimentlar

Oltingugurtning allotropik shakllarini hosil qilish:

Ishning maqsadi: Oltingugurtning S_8 (alfa) va S_6 (beta) shakllarini hosil qilish.

Borish tartibi: 100°C va 200°C haroratda, 1 atm va 1000 atm bosimda oltingugurtni isitish. Kristallarni o'rganish uchun rentgen diffraksiyasidan foydalanish.

Taxminiy xulosa : O`rganilgan adabiyotlarga ko`ra bundan S_8 shakli past haroratda barqaror, S_6 shakli yuqori bosim va haroratda hosil bo'ladi.

Oltingugurt va vodorod reaktsiyasi (Sulfid hosil qilish):

Ishning maqsadi: Oltingugurt va vodorod o'rtasidagi reaktsiyani o'rganish.

Borish tartibi: Oltingugurtni vodorod bilan 300°C haroratda reaksiyaga kiritish, hosil bo'lgan H_2S gazini o'lchash.

Taxminiy xulosa : Amorf oltingugurt ko'proq tezlikda reaktsiyaga kirishadi, S_8 esa sekinlashadi.

Issiqlik va elektr o'tkazuvchanligini o'lchash:

Ishning maqsadi: Oltingugurtning turli allotropik shakllarining issiqlik va elektr o'tkazuvchanligini o'lchash.

Borish tartibi: Alfa-oltingugurt (S_8) va amorf oltingugurtning elektr o'tkazuvchanligini o'lchash.

Taxminiy xulosa: Amorf oltingugurtning elektr o'tkazuvchanligi ancha yuqori.

Spektroskopiya yordamida molekulyar tuzilmani o'rganish:

Ishning maqsadi: Oltingugurtning molekulyar tuzilmasini aniqlash.

Borish tartibi: Infraqizil spektroskopiya (IR) yordamida S–S bog'lanishining intensivligini o'lchash.

Taxminiy xulosa: S_8 shaklida S–S bog'lanishlari kuchli, amorf shaklda esa ular ancha zaifroq.

Xulosa

Oltingugurtning funksional jihatlari: Oltingugurt kimyoviy jihatdan ko‘p qirrali element bo‘lib, u turli kimyoviy birikmalar hosil qilish qobiliyatiga ega. Uning o‘ziga xos reaksiyalari, gidrojen sulfid (H_2S), sulfatlar (SO_4^{2-}), sulfidlar (S^{2-}) va boshqa birikmalarni hosil qilishda muhim rol o‘ynaydi. Bu elementning biologik va sanoatdagi ahamiyati kattadir, chunki oltingugurt ko‘plab biologik jarayonlarda ishtirok etadi, shuningdek, energetika va kimyo sanoatida ham zaruriy xom ashyo sifatida ishlatiladi.

Allatropik shakl o‘zgarishi: Oltingugurtning allatropik shakllari (masalan, alfa-oltingugurt, beta-oltingugurt va boshqa shakllar) uning xususiyatlaridagi farqlarni va tabiiy sharoitlarga qarab o‘zgarishlarni ko‘rsatadi. Shakllarning o‘zgarishi (masalan, kristall tuzilishi, erish va qaynash nuqtalari, elektr o'tkazuvchanligi) oltingugurtning fizik va kimyoviy xususiyatlarining turlicha bo‘lishiga olib keladi. Bu shakllar o‘rtasidagi farqlar oltingugurtning qanday sharoitlarda, qanday vazifalarni bajarishini va uni qanday ishlatishni belgilaydi.

Oltingugurtning funksional jihatlari va allatropik shakllari o‘rganilishi metodologik jihatdan eksperimental tadqiqotlar va teorik modelga asoslanadi. Bu borada fizik-kimyoviy analiz usullari, kristallografik tadqiqotlar, spektroskopiya va boshqa zamonaviy ilmiy metodlar qo‘llaniladi. Shuningdek, oltingugurtning turli shakllarining o‘zaro ta’siri va ularning dinamikasi matematika va fizikaga asoslangan ilmiy yondashuvlarni talab etadi. Bu sohadagi tadqiqotlar davom etishi kerak, chunki oltingugurtning yangi xususiyatlari va shakllarining kashf etilishi texnologiya va tibbiyot sohalarida yangiliklarni yaratishi mumkin. Oltingugurtning allotropik shakllarining o'zgarishlari va uning funksional xususiyatlarini o'rganish nafaqat ilmiy jabhada, balki sanoat va texnologiyada ham keng qo'llaniladigan muhim soha hisoblanadi.

Bu o'zgarishlar va xususiyatlar haqida to'liq tushuncha hosil qilish uchun metodologik asoslar sifatida eksperimental va nazariy yondashuvlar birgalikda qo'llanilishi kerak.

Oltingugurtning allotropik shakllari va ularning o'zgarishi kimyo, fizika va materialshunoslik sohalarida yangi ilmiy izlanishlar va texnologik innovatsiyalarni rivojlantirishga yordam beradi.

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