

Scopus AI 使用简介:

Step 1: Scopus AI 自然语言提问

将自然语言处理 (LLM) 应用到 Scopus AI 中, 让科研人员可以直接通过对话提问的形式对任意科学问题进行提问, 比如直接在对话框中提问:




Scopus

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文献 作者 研究人员发现 Organizations Scopus AI **New**

Explore new topics and discover relevant references from 2013 [How it works](#)

What would you like to learn more about?
What are the ways to compress atomic nuclei to produce nuclear fusion? 

Step 2 Scopus AI 可溯源的概要及参考文献

基于提问, Scopus AI 生成一段对此提问基于科研论文的概要, 并提供了数篇主要引用的科研文献, 概要中每句描述都给出了相应的引用文献:

What are the ways to compress atomic nuclei to produce nuclear fusion?

Summary

Based on the query about compressing atomic nuclei to produce nuclear fusion, the following insights can be derived from the provided abstracts:

Ways to Compress Atomic Nuclei for Nuclear Fusion:

- **Room Temperature Fusion Technique:** One technique involves compressing a powder mixture of deuteride and catalytic material to achieve nuclear fusion at room temperature, resulting in an explosive reaction beyond known chemical processes [1](#) .

- **Fusion Reactions:** The most efficient fusion reaction involves merging hydrogenic isotopes, deuterium and tritium, to produce helium and a neutron, releasing 17.6 MeV of kinetic energy [2](#) .

- **Production of Superheavy Nuclei:** Various methods are proposed for producing superheavy nuclei, including the use of stable beams, radioactive beams, and symmetric fusion reactions. Stable beams are predicted to be the most favorable method for producing superheavy nuclei due to their higher intensities [3](#) [4](#) [5](#) .

- **Challenges and Considerations:** Synthesizing superheavy nuclei remains a challenge due to factors such as the quasifission mechanism, entrance channel parameters, and deformation parameters of the projectile and target nuclei. These factors significantly influence the success of fusion reactions [5](#) [6](#) .

- **Fusion of Exotic Nuclei:** Reactions such as fragmentation of heavy ions, direct reactions (e.g., (p, d), (d, p)), fission, and deep inelastic transfer are used for the synthesis of exotic nuclei near the boundaries of stability [7](#) .

Given the information from the abstracts, it is evident that various methods, including room temperature fusion techniques, stable beams, and specific fusion reactions, are proposed for compressing atomic nuclei to produce nuclear fusion. However, the direct compression of atomic nuclei is not explicitly discussed in the provided abstracts. Therefore, while the abstracts provide insights into different fusion methods and challenges, they do not directly address the specific ways to compress atomic nuclei for nuclear fusion.

References

- 1 A technique for making nuclear fusion in solids
Wayte R.
Journal of Condensed Matter Nuclear Science 2016
- 2 Challenges on the road towards fusion electricity
Donné T.
Europhysics News 2016
- 3 Possibilities for synthesis of new isotopes of superheavy nuclei in cold fusion reactions
Bao X.J., Gao Y., Li J.Q., Zhang H.F.
Physical Review C 2016

[Show all references](#)

Foundational documents

3861 citations

Nuclear ground-state masses and deformations
P.M., Möller, Peter M., J.R., Nix, James Rayford,
W.D., Myers, William D., W.J., Świątecki, Władysław J.
Atomic Data and Nuclear Data Tables 1995

199 citations

Isotopic dependence of fusion cross sections in reactions with heavy nuclei

G.G., Adamian, Gurgen G., N.V., Antonenko, Nikolai V.,
W., Scheid, Werner

Nuclear Physics, Section A 2000

[Show more documents](#)

Step 3 查看扩展概要及相关参考文献

Scopus AI 提供“扩展概要”(Expand Summary), 对选定的科学问题进行渐进式研究和扩展, 并得到有逻辑的基本综述框架, 可以精读问题相关的基础性文献

Based on the user's query, I will address the theoretical methods and experimental techniques for compressing atomic nuclei to achieve nuclear fusion, the challenges and limitations of this process, and the potential applications of compressed atomic nuclei in nuclear fusion research.

Theoretical Methods for Compressing Atomic Nuclei for Nuclear Fusion:

- The most efficient fusion reaction involves merging Deuterium and Tritium isotopes into Helium and a neutron, releasing 17.6 MeV of kinetic energy [1](#) .
- The book encompasses both magnetic and inertial confinements, as well as exotic mechanisms for nuclear fusion, including laser-driven compression [2](#) .
- The exchange Coulomb energy of charged particles paired in orthoboson has the character of attraction, leading to nuclear reactions without a Coulomb barrier, explaining the feasibility of low energy nuclear reactions [3](#) .

Experimental Techniques for Compressing Atomic Nuclei for Nuclear Fusion:

- A technique for making nuclear fusion at room temperature by compressing a powder mixture comprising a deuteride and catalytic material has been described, resulting in explosive reactions beyond known chemical reactions [4](#) .
- Experiments using a pulsed power facility induced collective nuclear interactions producing stable nuclei of virtually every element in the periodic table, supporting theoretical conjectures of heavy element nucleosynthesis in laboratory conditions [5](#) .

Challenges and Limitations of Compressing Atomic Nuclei for Nuclear Fusion:

- The synthesis of exotic nuclei near the boundaries of stability presents complicated problems in experimental nuclear physics, with special requirements for the choice of reactions and methods of transportation and registration due to their short lifetime and low binding energy [6](#) .
- Recent assessments of the strategic prospects of the nuclear energy industry suggest formidable technological, materials science, environmental, and economic problems in the full-scale development of nuclear energy programs, including fusion [7](#) .
- The quasifission mechanism restricts complete fusion to an indeterminably low evaporation residue cross-section for superheavy nuclei, posing a challenge to synthesizing elements in the eighth period using fusion reactions [8](#) .

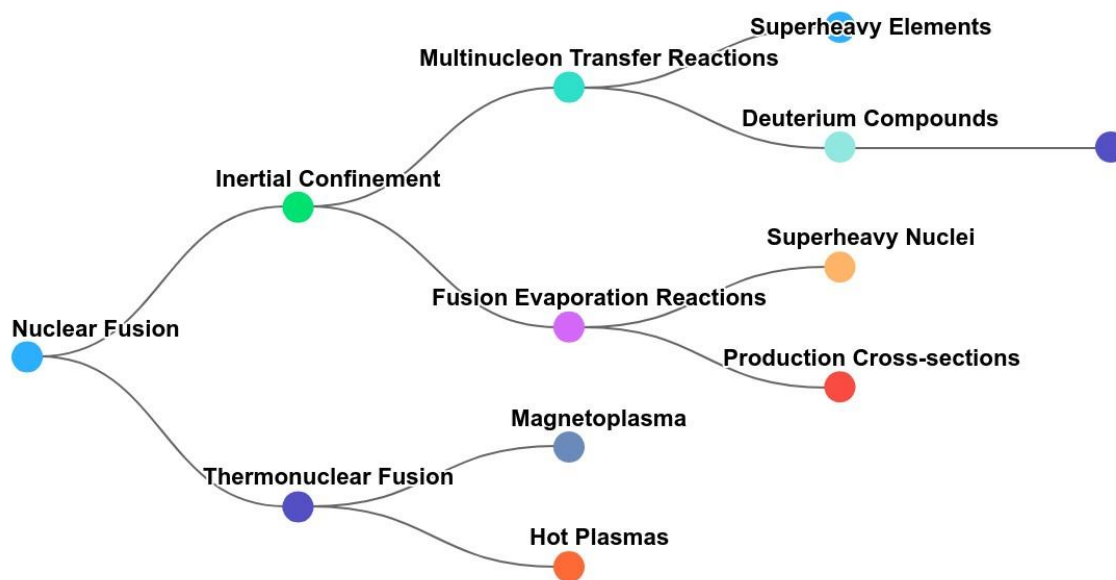
Potential Applications of Compressed Atomic Nuclei in Nuclear Fusion Research:

- Using metallic crystals as a medium for the fusion of light-element nuclei into heavier elements, accompanied by a significant release of energy, has been discussed, highlighting the potential for these reactions to serve as energy sources and open a new era in the history of civilization [9](#) .
- The superconducting fragment separator (Super-FRS) is a magnetic high-resolution spectrometer that will enable a variety of unique nuclear physics experiments, including the production and study of exotic hypernuclei and mesic atoms, as well as the discovery of new neutron-rich isotopes [10](#) .

In conclusion, theoretical methods for compressing atomic nuclei for nuclear fusion include merging hydrogenic isotopes and laser-driven compression, while experimental techniques involve room temperature compression and pulsed power facilities. Challenges include the synthesis of exotic nuclei, technological and environmental obstacles, and the quasifission mechanism. Potential applications encompass energy production and a variety of unique nuclear physics experiments.

Step 4 思维导图形成知识脉络

Scopus AI 提供独有的“思维导图”(Concept Map), 帮助用户快速形成知识脉络。



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Step 5 定位核心文献与领域专家

通过优化的 AI 算法自动提供有关此科学问题具有开创性意义、或奠定基础作用的关键性论文，及领域专家，无需阅读大量文献即可快速获得宏观全面的研究内容介绍。

Foundational documents

3861 citations

Nuclear ground-state masses and deformations

P.M., Möller, Peter M., J.R., Nix, James Rayford,
W.D., Myers, William D., W.J., Świątecki, Wladyslaw J.
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W., Scheid, Werner
Nuclear Physics, Section A ↗ 2000

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Topic experts



Clynes, Tom T.

28 citations 1 matching documents 2 h-index

Tom T. Clynes is an expert in nuclear fusion as evidenced by their publication on a new Z-pinch reactor, which demonstrates a simpler approach to achieving nuclear fusion. Their research and publication indicate a deep understanding of the challenges and innovative approaches in the field of nuclear fusion.

[Preview profile](#)

Don, Mewantha Aurelio Kaluthantrige M.A.K.

0 citations 1 matching documents 0 h-index

Mewantha Aurelio Kaluthantrige Don has demonstrated expertise in the realm of nuclear fusion with their recent publication on interstellar fusion propulsion. This indicates a focus on exploring advanced propulsion methods, showcasing their knowledge and involvement in cutting-edge fusion research.

[Preview profile](#)

Step 6 进阶研究, AI 建议提问

Scopus AI 基于提出的科学问题给出建议提问, 扩充研究的深度与广度, 洞察科学问题及各种研究主题隐含的更多信息, 凝练研究方向。

Go deeper

↳ How can magnetic confinement be used to compress atomic nuclei for nuclear fusion?

↳ What role does laser compression play in achieving nuclear fusion?

↳ What are the challenges in compressing atomic nuclei using inertial confinement?

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Scopus AI使用Tips

In conclusion, compressing a powder mixture, fusion reactions, fusion evaporation reactions, and multinucleon transfer reactions are some of the ways to compress atomic nuclei and produce nuclear fusion . [1] [2] [3]

Show 3 references



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What are the ways to compress atomic nuclei to produce nuclear fusion?

To compress atomic nuclei and produce nuclear fusion, several methods can be employed based on the information provided in the abstracts:

1. Fusion reactions: The most efficient fusion reaction involves merging hydrogenic isotopes, such as deuterium and tritium, to form helium and a neutron, releasing energy in the process .[1] This reaction is commonly used to generate electricity through fusion .[1]
2. Fusion evaporation reactions: Fusion evaporation reactions are used to synthesize superheavy nuclei (SHN) .[2] These reactions involve the production of unknown nuclei through fusion and subsequent evaporation of reaction products .[2] The synthesis of SHN with specific atomic numbers has been achieved using fusion evaporation reactions .[2]
3. Multinucleon transfer reactions: Multinucleon transfer reactions near the Coulomb barrier can be used to generate neutron-rich heavy nuclei and transuranium nuclei .[2] These reactions offer a promising pathway to produce neutron-rich nuclei .[2]

In conclusion, compressing a powder mixture, fusion reactions, fusion evaporation reactions, and multinucleon transfer reactions are some of the ways to compress atomic nuclei and produce nuclear fusion .[1] [2] [3]

References

1. [Challenges on the road towards fusion electricity][https://www.scopus.com/record/display.uri?eid=2-s2.0-84999268252&origin=scopusAI]

Donné, T. (7005610678)

Europhysics News, 2016

2. [Progress on production cross-sections of unknown nuclei in fusion evaporation reactions and multinucleon transfer reactions][https://www.scopus.com/record/display.uri?eid=2-s2.0-85150696836&origin=scopusAI]

Li, J.-J. (57216662182), Tang, N. (58590016300), Zhang, Y.-H. (57209458822), (...), Zhang, F.-S. (7404969719)

International Journal of Modern Physics E, 2023

3. [A technique for making nuclear fusion in solids][https://www.scopus.com/record/display.uri?eid=2-s2.0-85081974915&origin=scopusAI]

Wayte, R. (57215811891)

Journal of Condensed Matter Nuclear Science, 2016



技术支持和服务：

试用期间，如遇问题可联系清华大学图书馆信息参考部

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