

# ScienceDirect AI Quick Reference Guide



## Content

<a href="#">Starting your ScienceDirect AI journey</a>	2
<a href="#">Ask ScienceDirect AI</a>	3
<a href="#">Reading Assistant</a>	7
<a href="#">Compare Experiments</a>	9
<a href="#">My Library</a>	10
<a href="#">Navigation</a>	11

# Starting your ScienceDirect AI journey

Start your journey at [sciencedirect.com/ai](https://www.sciencedirect.com/ai)

## Why ScienceDirect AI?

- More insights, less noise
- Seamless integration with ScienceDirect
- Built with and for researchers



# Ask ScienceDirect AI

Ask ScienceDirect AI can provide insights across the underlying corpus of full-text, peer-reviewed scientific papers and book chapters.

Start at [sciencedirect.com/ai](https://sciencedirect.com/ai) by asking your research question in your own words.

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## Ask ScienceDirect AI

Discover insights across publications

[How it works](#)

What is your research question?

**B**  **Ask**

To gather insights on a topic, you can ask:

**C** [What is known about how microRNAs are involved in neural plasticity?](#)

To identify new areas of research, you can ask:

[What are the potential applications of nanotechnology in medicine, such as targeted drug delivery, tissue engineering, and diagnostics?](#)

To identify established experimental methods, you can ask:

[How can I test the effects of additive manufacturing on the structure, mechanical properties, and crystallinity of polymers?](#)

**D**

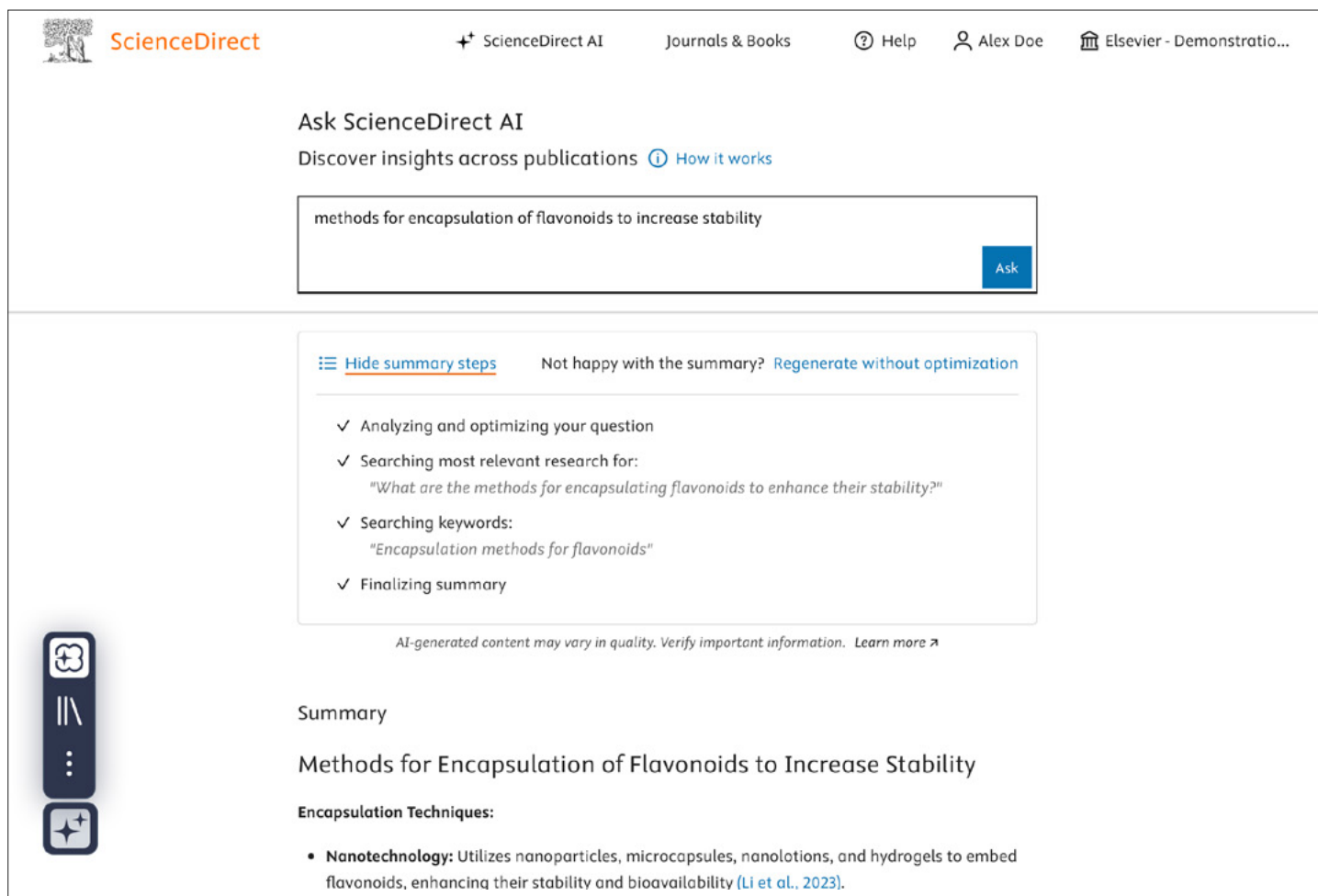
[Help us improve your experience](#) [Provide feedback](#)

- A.** Access Ask ScienceDirect AI via the URL or by selecting the ScienceDirect AI symbol in the header.
- B.** Natural language search - start your journey by describing what you are looking for in your own words, in any language.
- C.** Explore Ask ScienceDirect AI through pre-selected questions.
- D.** Navigate to other ScienceDirect AI features or learn more.

### Search tip

Don't worry about crafting precise keyword queries. The system will optimize your query to return the most relevant results.

## Agentic Approach and Hybrid Search



The screenshot displays the ScienceDirect AI interface. At the top, the ScienceDirect logo is on the left, and navigation links for ScienceDirect AI, Journals & Books, Help, Alex Doe, and Elsevier - Demonstratio... are on the right. The main heading is "Ask ScienceDirect AI" with a subtext "Discover insights across publications" and a link "How it works". A search bar contains the query "methods for encapsulation of flavonoids to increase stability" and an "Ask" button. Below the search bar, a summary section titled "Summary" shows the query and a list of steps: "Analyzing and optimizing your question", "Searching most relevant research for:", "Searching keywords:", and "Finalizing summary". A note states "AI-generated content may vary in quality. Verify important information. Learn more". The summary title is "Methods for Encapsulation of Flavonoids to Increase Stability". Under "Encapsulation Techniques:", a bullet point for "Nanotechnology" describes its use of nanoparticles, microcapsules, nanolotions, and hydrogels to embed flavonoids, enhancing their stability and bioavailability (Li et al., 2023).

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Ask ScienceDirect AI

Discover insights across publications [How it works](#)

methods for encapsulation of flavonoids to increase stability [Ask](#)

[Hide summary steps](#) Not happy with the summary? [Regenerate without optimization](#)

- ✓ Analyzing and optimizing your question
- ✓ Searching most relevant research for:
  - "What are the methods for encapsulating flavonoids to enhance their stability?"
- ✓ Searching keywords:
  - "Encapsulation methods for flavonoids"
- ✓ Finalizing summary

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Summary

Methods for Encapsulation of Flavonoids to Increase Stability

Encapsulation Techniques:

- **Nanotechnology:** Utilizes nanoparticles, microcapsules, nanolotions, and hydrogels to embed flavonoids, enhancing their stability and bioavailability (Li et al., 2023).

### Agentic Approach

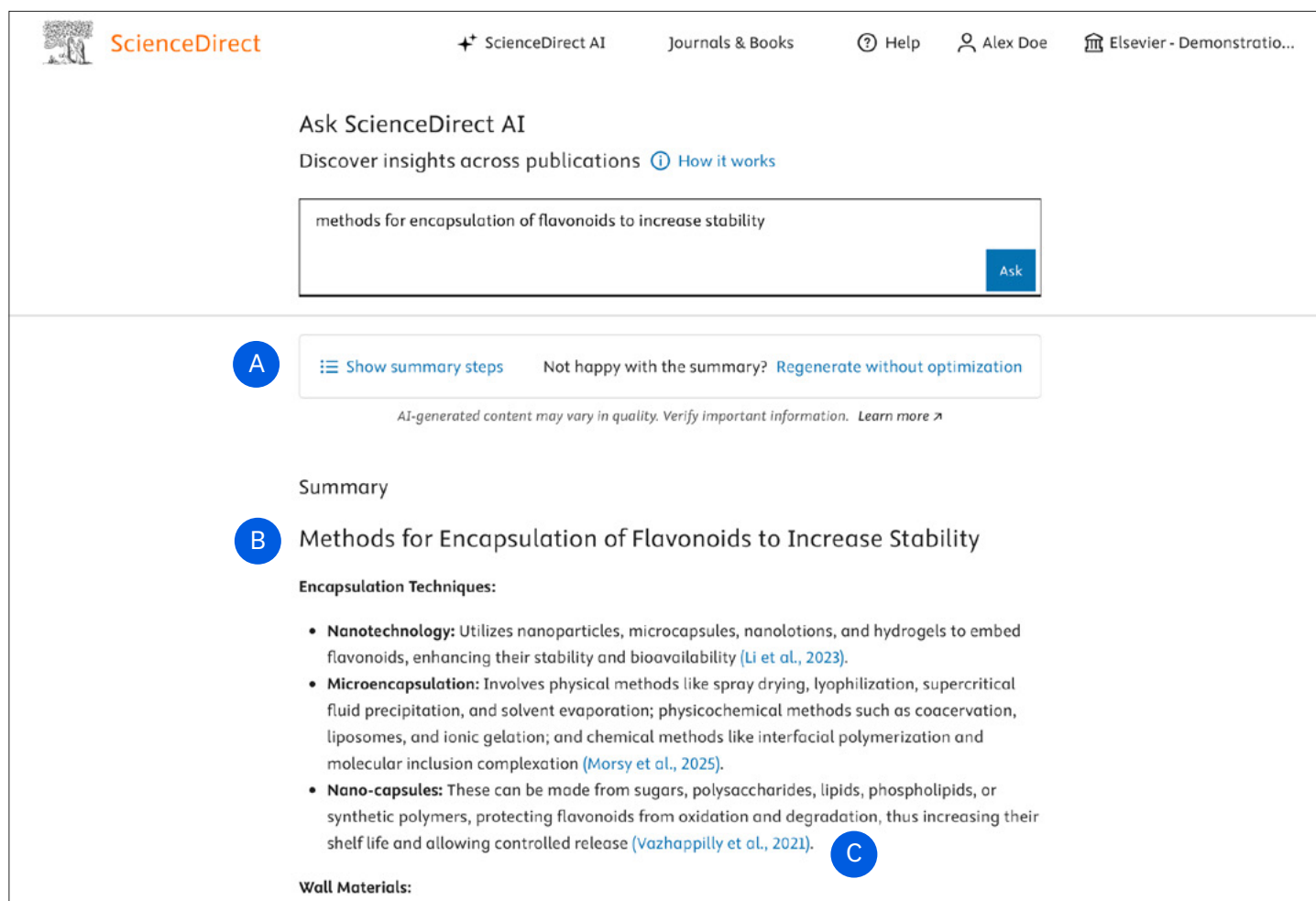
ScienceDirect AI uses a query optimization tool to ensure you get the expected results, e.g. by fixing any typos, expanding abbreviations, translating and rephrasing where necessary.

### Hybrid Search

The tool then decides whether to use a natural language version of the query, a keyword version, or both, to retrieve the most relevant content to generate a summary response.

You can always choose to regenerate the response without optimizations.

## Understanding your search results



The screenshot displays the Ask ScienceDirect AI interface. At the top, the ScienceDirect logo is on the left, and navigation links for ScienceDirect AI, Journals & Books, Help, Alex Doe, and Elsevier - Demonstratio... are on the right. The main heading is "Ask ScienceDirect AI" with a subtext "Discover insights across publications" and a link "How it works". A search bar contains the query "methods for encapsulation of flavonoids to increase stability" with an "Ask" button. Below the search bar, a summary section is labeled "Summary". The main heading for the summary is "Methods for Encapsulation of Flavonoids to Increase Stability". Under this, the section "Encapsulation Techniques:" lists three bullet points: "Nanotechnology", "Microencapsulation", and "Nano-capsules". Each bullet point describes a method and includes a reference link. A "Wall Materials:" section is partially visible at the bottom. A blue circle with the letter 'A' is positioned to the left of the search bar, a blue circle with the letter 'B' is to the left of the summary heading, and a blue circle with the letter 'C' is to the right of the "Nano-capsules" bullet point.

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methods for encapsulation of flavonoids to increase stability [Ask](#)

**A** [Show summary steps](#) Not happy with the summary? [Regenerate without optimization](#)

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Summary

**B** **Methods for Encapsulation of Flavonoids to Increase Stability**

**Encapsulation Techniques:**

- **Nanotechnology:** Utilizes nanoparticles, microcapsules, nanolotions, and hydrogels to embed flavonoids, enhancing their stability and bioavailability ([Li et al., 2023](#)).
- **Microencapsulation:** Involves physical methods like spray drying, lyophilization, supercritical fluid precipitation, and solvent evaporation; physicochemical methods such as coacervation, liposomes, and ionic gelation; and chemical methods like interfacial polymerization and molecular inclusion complexation ([Morsy et al., 2025](#)).
- **Nano-capsules:** These can be made from sugars, polysaccharides, lipids, phospholipids, or synthetic polymers, protecting flavonoids from oxidation and degradation, thus increasing their shelf life and allowing controlled release ([Vazhappilly et al., 2021](#)). **C**

**Wall Materials:**

- A.** See the steps Ask ScienceDirect AI took to respond to your query.
- B.** Summary response of your query.
- C.** References to the articles that were used to create the summary.

## References from summary

References from summary (8)

A	<p>Oral delivery of hydrophobic flavonoids and their incorporation into functional foods: Opportunities and challenges</p> <p>Ruwanthi Premathilaka, Ali Rashidinejad, ... Jaspreet Singh</p> <p><i>Food Hydrocolloids</i> • 2022</p> <p><a href="#">+ Add to My Library</a> <a href="#">Copy</a></p>	<p>Recent encapsulation techniques for hydrophobic flavonoids utilize wall materials like lipids, polysaccharides, and proteins. The document discusses various aspects of encapsulation systems that improve bioavailability and stability.</p> <p>How relevant is this answer? ☆☆☆</p>
	<p>Towards innovative food processing of flavonoid compounds: Insights into stability and bioactivity</p> <p>Yu Fu, Wanning Liu, Olugbenga P. Soladoye</p> <p><i>LWT</i> • 2021</p> <p><a href="#">+ Add to My Library</a> <a href="#">Copy</a></p>	<p>Hydroxyl group modification and physical encapsulation using liposomes can enhance flavonoid stability. The presence of certain food components may negatively impact bioavailability, while others can improve it.</p> <p>How relevant is this answer? ☆☆☆</p>
B	<p>Preparation and characterization of zein–lecithin–total flavonoids from <i>Smilax glabra</i> complex nanoparticles and the study of their antioxidant activity on HepG2 cells</p> <p>Jing Li, Yingxiu Zhang, ... Zhigang Yan</p> <p><i>Food Chemistry: X</i> • 2023</p> <p><a href="#">+ Add to My Library</a> <a href="#">Copy</a></p>	<p>Chemical modification of flavonoids can improve stability, but safety concerns exist. Nanomaterials like nanoparticles and microcapsules are often used for effective flavonoid delivery.</p> <p>How relevant is this answer? ☆☆☆ <b>C</b></p>

- A.** A bespoke summary from each reference about your specific question or query. Understand how specific insights in the document relate to what you need to know.
- B.** Add references to your library to read later or copy the citation information.
- C.** Rate how relevant each reference is to your query.

## Related insights and other actions

Related insights (2)

A	<p>Flavonoids</p> <p>Lingchao Miao, Haolin Zhang, ... Jianbo Xiao</p> <p><i>Antioxidants Effects in Health</i> • 2022</p> <p><a href="#">+ Add to My Library</a> <a href="#">Copy</a></p>	<p>Various methods to enhance flavonoid stability include low temperature, ascorbic acid addition, cocrystallization, solid dispersion, nanotechnology, microemulsion, inclusion complexes, and chemical or enzymatic acylation.</p> <p>How relevant is this answer? ☆☆☆</p>
	<p>Recent advances in chitosan-based active and intelligent packaging films incorporated with flavonoids</p> <p>Xuanzhuo Liu, Fengfeng Xu, ... Jun Liu</p> <p><i>Food Chemistry: X</i> • 2025</p> <p><a href="#">+ Add to My Library</a> <a href="#">Copy</a></p>	<p>Effective stabilization techniques for flavonoids include encapsulation and structural modification. The properties of encapsulating materials and their effects on stability need further investigation.</p> <p>How relevant is this answer? ☆☆☆</p>

Other actions:

B

[Compare experiments ↗](#)

Ask another question:

↳ techniques for flavonoid encapsulation to enhance stability ↗


↳ what are the roles of different encapsulation materials for flavonoids? ↗


↳ how does microencapsulation affect the bioavailability of flavonoids? ↗

C



## Reference preview


**ScienceDirect**

 ScienceDirect AI
 Journals

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[Show summary steps](#)
[Not happy with the summary?](#)

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**Summary**  
**Methods for Encapsulation of Flavonoids**  
**Encapsulation Techniques:**

- **Nanotechnology:** Utilizes nanoparticles, microcapsules, and nanofibers to encapsulate flavonoids, enhancing their stability and bioavailability.
- **Microencapsulation:** Involves physical methods like spray drying, fluid precipitation, and solvent evaporation; physicochemical methods like liposomes, and ionic gelation; and chemical methods like molecular inclusion complexation ([Morsy et al., 2025](#)).
- **Nano-capsules:** These can be made from sugars, polysaccharides, synthetic polymers, protecting flavonoids from oxidation, extending shelf life and allowing controlled release ([Vazhappilly et al., 2023](#)).

**Wall Materials:**

**Reference preview**

**Nanoparticle-based flavonoid therapeutics: Pioneering biomedical applications in antioxidants, cancer treatment, cardiovascular health, neuroprotection, and cosmeceuticals**  
 Hadeer M.MorsyMohamed Y.ZakyNour Y.S.YassinAshraf Y.Z.Khalifa  
*International Journal of Pharmaceutics* • 2025  
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**Answer found in section: "Nanoparticle-Flavonoid formulations"**  
 Encapsulation may minimize flavonoid degradation during processing or storage, and follow physiological breakdown due to gastrointestinal digestion via the oral route ([Premathilaka et al., 2022](#)). Encapsulation is the technique of encasing active chemicals (solid, liquid, or gas) in a wall material to create capsules ranging in size from micrometers to millimeters ([Sundar and Parikh, 2023](#)). The encapsulating agents and encapsulation method must be carefully chosen to create capsules with the necessary qualities. Encapsulating materials must be "generally recognized as safe" GRAS, cheap, and free of reactivity with the core substance ([Hedayati et al., 2023](#)). Furthermore, the coating agent's designation should consider functionality, capsule level, target release, and stability ([Saadi et al., 2023](#)). Encapsulation materials are mainly composed of carbohydrates, proteins, and lipids.

## Summarized responses

Select any reference in your results to view a summarized response. ScienceDirect AI will read and distill insights from the underlying content returned from your search. Every assertion references one or more specific passages from source documents.

## Source snippets

See the specific source passage from the content used to create the GenAI summary.

# Reading assistant

The Reading Assistant is a versatile tool designed for question responding, analysis, or summarization of individual articles.

It is available on all full-text articles and book chapters on ScienceDirect that you have entitlement to via a subscription, open access, open archive or promotional access.

The screenshot shows the ScienceDirect interface for an article titled "Towards innovative food processing of flavonoid compounds: Insights into stability and bioactivity". The article is from the journal LWT, Volume 150, October 2021, 111968. The authors are Yu Fu, Wanning Liu, and Olugbenga P. Soladoye. The article is available as a PDF. The Reading Assistant sidebar on the right provides several interactive options:

- A:** Suggested questions to ask about the article - Research questions derived from the full-text article to help you begin interacting with the tool.
  - What impacts do non-thermal treatments have on flavonoid compounds from various food sources?
  - How do the intrinsic characteristics of food matrices influence flavonoid stability during processing?
  - How does high-pressure processing affect the degradation of flavonoids?
- B:** Prompt to summarize the article.
  - Summarize this article
  - Summarize experiments
- C:** Link to summarize experiments in this article.
  - methods for encapsulation of flavonoids to increase stability
- D:** Ask a question to this article in your own words and your own language (responds in English).
  - Encapsulation methods to increase flavonoid
  - Ask about this article

- A.** Suggested questions to ask about the article - Research questions derived from the full-text article to help you begin interacting with the tool.
- B.** Prompt to summarize the article.
- C.** Link to summarize experiments in this article.
- D.** Ask a question to this article in your own words and your own language (responds in English).

## Tool tip

Gain more insights from the article by having a conversation with the Reading Assistant.



## Coming from search

When clicking "View Article" from a reference in Ask ScienceDirect AI, if you have entitlement to the full text, your question will accompany the article and generate a longer summary response within the 'Reading Assistant' for the specific article being viewed.

### Source references

The generated response include in-text references as evidence to support the claims. When you click on the numbered references, they will highlight the information snippets that were used to respond to the question in the text.

### Surfacing previous queries


Easily view your past queries and their corresponding response.

### Asking follow-up questions

Ask follow-up questions without needing to repeat the terms or information referenced in earlier queries.

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 **Materials Science and Engineering: C**  
Volume 123, April 2021, 111945

# Structure-function assessment of 3D-printed porous scaffolds by a low-cost/open source fused filament fabrication printer

Raúl Vallejos Baier <sup>a1</sup>✉, José I. Contreras Raggio <sup>a1</sup>✉, Carlos Toro Arancibia <sup>a1</sup>✉, Miguel Bustamante <sup>b2</sup>✉, Luis Pérez <sup>c3</sup>✉, Iurii Burda <sup>d</sup>✉, Ameet Aiyangar <sup>d,e4</sup>✉, Juan F. Vivanco <sup>a1</sup>✉

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## Reading Assistant

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- The in-house printer achieved higher resolution and better fit to the designed pore sizes compared to the commercial printer. [2](#) [3](#)
- The in-house printer could achieve pore sizes as small as 100-200  $\mu\text{m}$  by varying the infill percentage. [3](#)

Biological Assessment

- Preliminary cell adhesion tests on scaffolds printed with the in-house printer showed adhesion efficiencies around 50% compared to controls. [4](#)

Chemical Characterization

- FTIR-ATR analysis showed no substantial chemical changes in the PLA material after printing in either printer. [5](#)

The results demonstrate the in-house FFF printer's capability to manufacture tissue engineering scaffolds with controlled microarchitecture, mechanical properties, and biological performance, making it a cost-effective approach for related research.

# Compare Experiments

The “Compare” links on the Search and Summarize page and the regular ScienceDirect Search page will pull out the facts that matter, from each study within and across eligible full text papers in the results list.

## Search tip

When looking to compare experiments within search results, simply select the papers you want to use before selecting Compare Experiments.

Ask ScienceDirect AI

Discover insights across publications [How it works](#)

methods for encapsulation of flavonoids to increase stability

Ask

Related insights (2)

Other actions:

[Compare experiments](#)

Ask another question:

[techniques for flavonoid encapsulation to enhance stability](#)

[how do different encapsulation materials affect flavonoid stability](#)

[what role does microencapsulation play in flavonoid preservation](#)

Find articles with these terms

sleep exercise impact brain atrophy

Advanced search

Ask ScienceDirect AI

Ask questions about “sleep exercise impact brain atrophy” and get answers with AI summaries from relevant research

Try it out

Download 2 articles Export [Compare Experiments](#) sorted by relevance | date

Review article Full text access

1 The alterations of sleep and frontal functions in chronic hemodialysis: Pathogenesis and therapeutic perspectives

Behavioural Brain Research, 26 February 2025

Giulia Belluardo, Concetto Sessa, Walter Marale

View PDF Abstract Graphical Abstract Extracts Figures Export

Research article Open access

2 Impact of mind-body interventions in older adults with mild cognitive impairment: a systematic review

International Psychogeriatrics, May 2019

Maryam Farhang, Claudia Miranda-Castillo, ... Guilherme Furtado

View PDF Abstract Extracts Figures Export

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[Compare experiments](#) Beta

AI-summarized research experiments or studies for:  
“methods for encapsulation of flavonoids to increase stability”

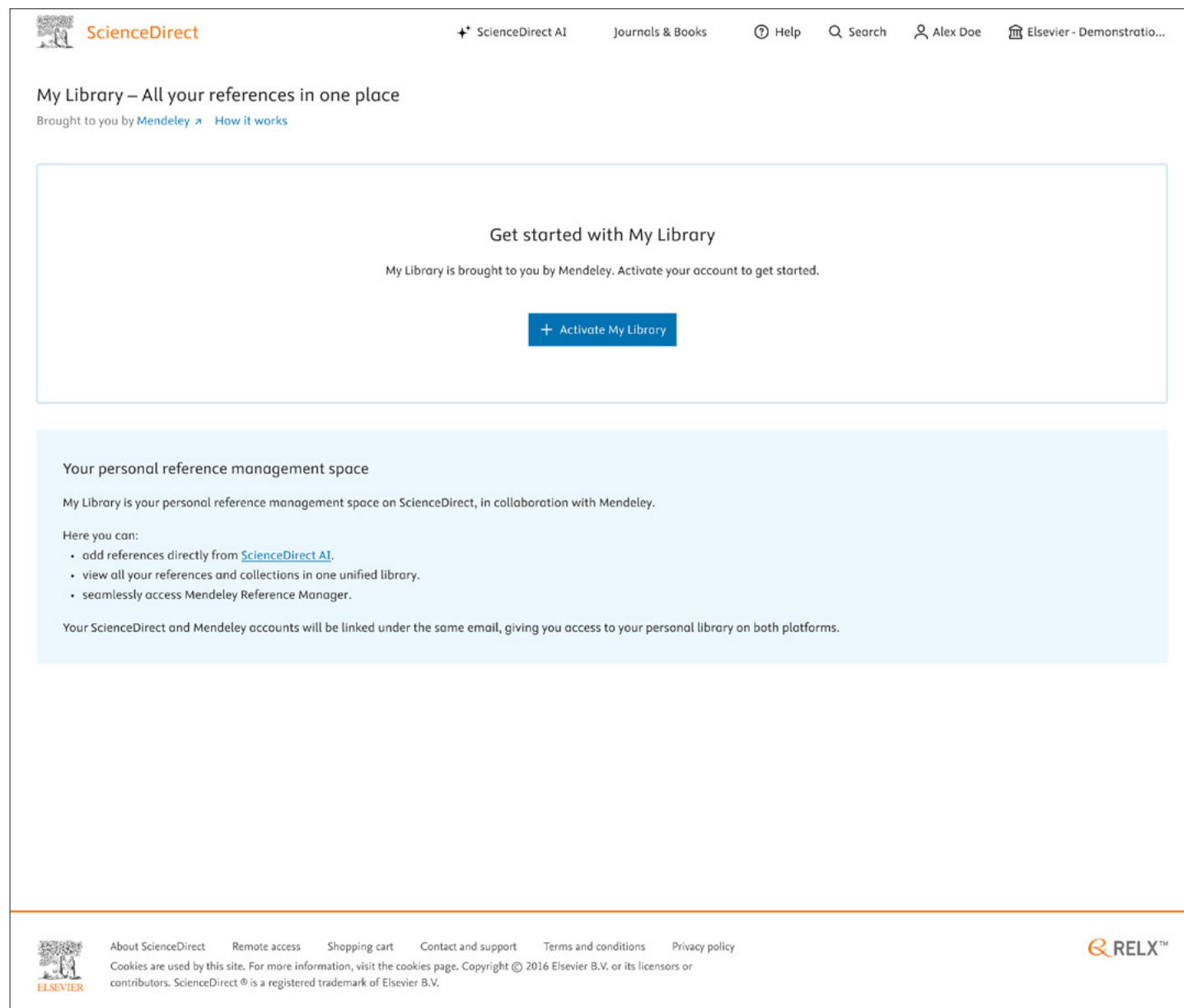
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ARTICLE	EXPERIMENT / STUDY	GOAL	MATERIALS	METHODS
<a href="#">Article</a> <b>Towards innovative food processing of flavonoid compounds: Insights into stability and bioactivity</b> Yu Fu, Wanning Liu, Olugbenga P. Soladoye LWT • Volume 150 • 2021 <a href="#">Export article as CSV</a>	<a href="#">Review of existing literature</a>	To discuss the impacts of structure on the stability of flavonoids	Flavonoids, hydroxyl groups, glycosyl groups, methyl groups, acyl groups, lecithin, Tween-20, metal ions, proteins, dietary fiber, carbohydrates	Reviewed the existing literature on the impacts of different structural features of flavonoids on their stability, including the effects of hydroxyl groups, glycosyl groups, methyl groups, acyl groups, and the influence of external factors like colloidal structures, metal ions, proteins, dietary fiber, and carbohydrates.
	<a href="#">Review of existing literature</a>	To summarize the impacts of different thermal processing methods on the stability and bioactivity of flavonoids	Flavonoids, microwave, radio frequency, ohmic heating	Reviewed the existing literature on the effects of different thermal processing methods like microwave heating, radio frequency heating, and ohmic heating on the retention of flavonoid contents and antioxidant activities in various food sources.

# My Library

The My library page on ScienceDirect is your personal reference space, designed to streamline your reference management. Save and view your cited papers in one convenient place.



The screenshot shows the ScienceDirect 'My Library' page. At the top is the ScienceDirect logo and a navigation bar with links for ScienceDirect AI, Journals & Books, Help, Search, and a user profile for Alex Doe. The main heading is 'My Library – All your references in one place', followed by a subtext 'Brought to you by Mendeley' and a link 'How it works'. A large central box contains the text 'Get started with My Library' and 'My Library is brought to you by Mendeley. Activate your account to get started.', with a prominent blue button labeled '+ Activate My Library'. Below this, a light blue section titled 'Your personal reference management space' explains that My Library is a personal reference management space on ScienceDirect, in collaboration with Mendeley. It lists three capabilities: adding references from ScienceDirect AI, viewing all references in a unified library, and seamless access to Mendeley Reference Manager. A note states that ScienceDirect and Mendeley accounts will be linked under the same email. The footer includes the Elsevier logo, a list of links (About ScienceDirect, Remote access, Shopping cart, Contact and support, Terms and conditions, Privacy policy), a cookie notice, and the RELX™ logo.

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## My Library – All your references in one place

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### Get started with My Library

My Library is brought to you by Mendeley. Activate your account to get started.

[+ Activate My Library](#)

#### Your personal reference management space

My Library is your personal reference management space on ScienceDirect, in collaboration with Mendeley.

Here you can:

- add references directly from [ScienceDirect AI](#).
- view all your references and collections in one unified library.
- seamlessly access Mendeley Reference Manager.

Your ScienceDirect and Mendeley accounts will be linked under the same email, giving you access to your personal library on both platforms.


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RELX™

# Navigation

Use the navigation widget to jump to other features on ScienceDirect AI.



- A Ask ScienceDirect AI
- B My Library
- C Information, Help, and Frequently Asked Questions
- D Minimize navigation widget

Start your journey at [sciencedirect.com/ai](https://sciencedirect.com/ai)