

literature melting point of dibenzalacetone

literature melting point of dibenzalacetone is a vital parameter often referenced in organic chemistry, especially among students, researchers, and laboratory professionals working with this compound. Understanding the literature melting point of dibenzalacetone is crucial for confirming purity, assessing synthesis success, and comparing results with established scientific data. This article explores the literature melting point of dibenzalacetone in detail, including its definition, importance, factors influencing melting point variations, typical literature values, methods of determination, and common applications. Readers will also gain insights into troubleshooting discrepancies in melting point measurements and practical tips for accurate results. Whether you are a student performing a synthesis, a lab technician validating compound identity, or a researcher publishing findings, this comprehensive guide will ensure you have reliable information about dibenzalacetone's melting point and its significance in organic chemistry.

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Understanding Dibenzalacetone and its Physical Properties

Dibenzalacetone, also known as 1,5-diphenylpenta-1,4-dien-3-one, is a yellow crystalline compound commonly synthesized in undergraduate organic chemistry laboratories. It is produced via an aldol condensation reaction between benzaldehyde and acetone. Dibenzalacetone's structure contains conjugated double bonds and aromatic rings, imparting unique physical properties, including color, solubility, and melting point.

The melting point of dibenzalacetone serves as a key indicator of its purity and crystalline nature. Typically, pure dibenzalacetone appears as pale yellow crystals and exhibits a defined melting range, making it ideal for educational and research applications.

Significance of Literature Melting Point in Organic Chemistry

The literature melting point refers to the value reported in peer-reviewed scientific publications, chemical databases, and reference texts for a compound under standardized conditions. For dibenzalacetone, this value is critical for:

- Assessing compound purity after synthesis
- Comparing experimental results with established data
- Identifying possible contaminants or by-products
- Confirming compound identity in research and teaching labs
- Ensuring consistency in chemical manufacturing and quality control

Organic chemists routinely consult literature melting points to validate their experimental procedures

and to troubleshoot if their results deviate from expected norms.

Reported Literature Melting Point Values for Dibenzalacetone

Typical Melting Point Range

The literature melting point of dibenzalacetone is most commonly cited in the range of 110°C to 112°C. Authoritative sources, including chemical handbooks and peer-reviewed journals, consistently report values within this narrow range, reflecting the compound's purity when properly synthesized and crystallized.

Variations in Literature Reports

Minor variations exist in literature values, sometimes extending from 109°C up to 114°C. These discrepancies can arise due to differences in measurement techniques, sample preparation, atmospheric conditions, or the presence of trace impurities. It is important for users to reference the most recent and reputable sources, such as the Merck Index, Aldrich catalog, or major organic chemistry textbooks, when citing the melting point of dibenzalacetone.

Summary Table of Literature Sources

- Merck Index: 111–112°C
- Aldrich Chemical Catalog: 110–112°C
- CRC Handbook of Chemistry and Physics: 110–112°C
- Organic Syntheses Journal: 111°C

This consolidated data provides a reliable benchmark for laboratories and academic settings.

Methods for Determining the Melting Point of Dibenzalacetone

Capillary Melting Point Apparatus

The capillary melting point method is the most widely used technique for measuring the melting point of dibenzalacetone. In this procedure, a small amount of the crystalline sample is packed into a thin-walled glass capillary tube, which is then placed in a heated block or oil bath. The temperature at which the solid transitions to a clear liquid is recorded as the melting point.

Digital Melting Point Devices

Modern laboratories often use digital melting point apparatuses for increased accuracy and reproducibility. These devices feature automated temperature ramping and digital displays, minimizing human error and allowing precise determination of the onset and completion of melting.

Best Practices for Accurate Measurements

- Use finely powdered, dry samples to ensure uniform heating
- Calibrate equipment with reference standards before use
- Record both the start and end points of melting for precise ranges
- Repeat measurements to confirm consistency

Factors Affecting Melting Point Measurements

Sample Purity

Impurities are the most common cause of melting point depression and range broadening. Even minor contamination can lower the observed melting point or create a wider melting range. Pure dibenzalacetone should melt sharply within the literature range.

Moisture and Solvent Residues

Residual solvent or moisture from recrystallization can affect the melting behavior, often resulting in a lower or smeared melting point. Samples should be thoroughly dried before measurement.

Instrumentation and Calibration

Melting point apparatuses must be properly calibrated using certified standards (e.g., benzoic acid) to ensure accuracy. Uncalibrated equipment may yield erroneous results, misleading researchers regarding purity or identity.

Atmospheric Pressure

While the effect of atmospheric pressure on solid melting points is minimal compared to boiling points, extreme variations (e.g., high altitude laboratories) can cause slight shifts in measured values.

Applications and Uses Related to Dibenzalacetone's Melting Point

Educational Laboratory Experiments

Dibenzalacetone is frequently synthesized in undergraduate labs as a classic example of aldol condensation. Students use melting point determination to assess the success of their synthesis and compare results to literature data, reinforcing concepts of purity and characterization.

Quality Control in Chemical Manufacturing

Industrial settings rely on melting point data to confirm the consistency of dibenzalacetone batches. Deviations from the literature melting point may indicate contamination, improper synthesis, or issues in crystallization.

Research and Publication Standards

Researchers publishing new methods or studies involving dibenzalacetone must report melting points that align with accepted literature values. Outliers may prompt further investigation or clarification during peer review.

Troubleshooting Melting Point Discrepancies

Why Your Melting Point May Differ from Literature

If your measured melting point of dibenzalacetone falls outside the literature range, consider the following factors:

- Presence of impurities or incomplete reaction
- Residual solvent from recrystallization
- Improper sample preparation (e.g., large crystal size)
- Uncalibrated or faulty equipment
- Rapid heating rate causing inaccurate readings

Steps to Improve Accuracy

To obtain reliable melting point measurements, thoroughly purify and dry your sample, calibrate your apparatus, and use appropriate sample size and heating rates. If discrepancies persist, consider repeating the synthesis or consulting additional literature sources.

Summary of Key Points

The literature melting point of dibenzalacetone is a well-established reference value, typically cited as 110–112°C in major chemical databases and textbooks. Accurate measurement and interpretation of this physical property are essential for confirming compound purity, validating experimental procedures, and ensuring quality control in academic and industrial settings. By understanding the factors influencing melting point determination and consulting reliable literature sources, users can maximize the utility of this important analytical parameter.

Trending and Relevant Questions and Answers about Literature Melting Point of Dibenzalacetone

Q: What is the most commonly cited literature melting point of dibenzalacetone?

A: The most commonly cited literature melting point of dibenzalacetone is 110–112°C, according to reputable sources such as the Merck Index and the CRC Handbook of Chemistry and Physics.

Q: Why is the melting point important in assessing dibenzalacetone

purity?

A: The melting point is a key indicator of purity; pure dibenzalacetone melts sharply within the literature range, while impurities can lower or broaden the melting point range.

Q: How can I accurately measure the melting point of dibenzalacetone in the laboratory?

A: Use a calibrated capillary melting point apparatus or a digital melting point device, ensure the sample is dry and finely powdered, and heat at a controlled rate for best results.

Q: What factors may cause deviations from the literature melting point for dibenzalacetone?

A: Common causes include impurities, residual solvent, moisture, uncalibrated equipment, and rapid heating rates.

Q: Can atmospheric pressure affect the melting point of dibenzalacetone?

A: Atmospheric pressure has a minimal effect on the melting point of solids like dibenzalacetone, but extreme conditions (e.g., high altitude) may cause slight variations.

Q: What should I do if my measured melting point is lower than the literature value?

A: Recrystallize and dry your sample thoroughly, recalibrate your equipment, and repeat the measurement to rule out impurities and technical errors.

Q: Where can I find authoritative literature values for dibenzalacetone's melting point?

A: Reliable sources include the Merck Index, Aldrich Chemical Catalog, CRC Handbook of Chemistry and Physics, and peer-reviewed organic chemistry journals.

Q: Is dibenzalacetone's melting point used for compound identification?

A: Yes, melting point determination is a standard method for confirming the identity and purity of dibenzalacetone in both educational and research laboratories.

Q: What is the impact of residual solvent on dibenzalacetone's melting point?

A: Residual solvent can depress and broaden the melting point, indicating incomplete drying or purification of the sample.

Q: How does recrystallization affect the melting point of dibenzalacetone?

A: Proper recrystallization enhances purity, resulting in a sharper and more accurate melting point that closely matches literature values.

Literature Melting Point Of Dibenzalacetone

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Literature Melting Point of Dibenzalacetone: A Comprehensive Guide

The seemingly simple question of "what is the melting point of dibenzalacetone?" reveals a fascinating complexity. Finding a single, definitive answer proves surprisingly challenging, highlighting the nuances of experimental chemistry and the importance of critically evaluating reported data. This post delves into the literature surrounding dibenzalacetone's melting point, exploring the factors influencing variations, providing a range of reported values, and guiding you toward a more informed understanding. We'll analyze different sources, explain potential discrepancies, and ultimately equip you to confidently interpret melting point data for this common organic compound.

Understanding Dibenzalacetone and its Melting Point

Dibenzalacetone (DBA), also known as dibenzylideneacetone, is a yellowish crystalline solid often synthesized as a classic organic chemistry experiment. Its melting point serves as a crucial indicator of its purity. A pure sample melts sharply over a narrow temperature range, while impurities broaden the melting point range and lower the observed temperature. This is why consistent, accurate reporting of the melting point is essential for verifying the synthesis's success and the compound's identity.

Reported Melting Points in the Literature: A Range of Values

A quick search reveals a range of melting points reported for dibenzalacetone in the scientific literature. You'll find values ranging from 105°C to 115°C, sometimes even higher, depending on the source and experimental conditions. This variation underscores the critical need for context.

Factors Influencing Melting Point Variations

Several key factors contribute to this observed range of melting points:

Purity of the Sample: The most significant factor. Even trace impurities can drastically lower and broaden the melting point. The presence of starting materials (benzaldehyde, acetone) or side products significantly impacts the observed melting point.

Polymorphism: Dibenzalacetone can exist in different crystalline forms (polymorphs), each exhibiting a distinct melting point. The synthesis method and crystallization conditions can influence which polymorph is obtained.

Experimental Error: Variations in heating rate, thermometer calibration, and sample preparation techniques can all introduce error in melting point determination.

Solvent Residues: Incomplete drying after recrystallization can leave residual solvent trapped within the crystals, leading to a lower melting point.

Critically Evaluating Literature Data

When searching for the melting point of dibenzalacetone, it's crucial to critically evaluate the source. Look for:

Reputable Journals: Peer-reviewed articles in established chemical journals generally provide more reliable data.

Detailed Experimental Procedures: A well-described synthesis and purification method increases confidence in the reported melting point.

Confirmation of Purity: The authors should clearly state how the purity of their dibenzalacetone sample was verified (e.g., using techniques like melting point determination itself, NMR spectroscopy, or TLC).

Multiple Data Points: A single reported melting point is less reliable than multiple measurements from independent experiments.

Practical Implications and Best Practices

Knowing the range of possible melting points is vital for organic chemistry students and researchers. A value outside the typical range (105-115°C) often indicates impurities requiring further purification. The best practice is to carefully record your own experimental melting point alongside a detailed description of the experimental procedure and purification techniques.

Conclusion

The literature melting point of dibenzalacetone isn't a single, fixed number. The range of values reflects the influence of several factors, primarily the purity of the sample and experimental conditions. By understanding these contributing factors and critically evaluating reported data, you can better interpret melting point results and confidently assess the quality of your dibenzalacetone synthesis. Remember that your own experimentally determined melting point, along with thorough characterization, provides the most reliable data for your specific sample.

FAQs

1. What is the most commonly reported melting point for dibenzalacetone? While there's a range, values between 108°C and 112°C are frequently reported in the literature.
2. Why is my dibenzalacetone's melting point lower than expected? Impurities are the most likely culprit. Recrystallization is often necessary to purify the sample.
3. Can the melting point of dibenzalacetone be used to confirm its identity? While it's a helpful indicator, it should be combined with other characterization techniques (e.g., NMR, IR spectroscopy) for definitive identification.
4. How can I improve the accuracy of my melting point determination? Use a calibrated thermometer, a slow heating rate, and a small, finely powdered sample.
5. What other factors besides purity affect the melting point besides the ones already mentioned? The rate of heating during the experiment and the quality of the melting point apparatus itself can also subtly influence the observed melting point.

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To illustrate the impact microwave assisted organic synthesis can have on chemical research, case studies drawn mainly from the pharmaceutical industry are presented.

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