

**FYO - 00191/243**

**Reassessment: Lab-based Portfolio**

**Part 3: Creating a guide on a laboratory technique**

You have been approached by Keele University’s infamous **‘Foundation Year Science Magazine’** (a fictitious publication) and asked to produce an information guide on the laboratory technique: **recrystallisation**. The guide should be suitable for foundation year students, and should be 1-2 pages in length (including figures and references).

You should include the following information:

* What is meant by recrystallisation (in chemistry), and why it is used.
* How the process works
* Labelled diagrams to explain the stages of process
* Importance of the solvent
* Pros and cons of the technique
* References – these must include in-text references, with the full reference given at the end.

Remember that this information is aimed at Foundation Year students, so it is important that you consider your audience when writing your guide – make sure that the language used is accessible, and any scientific terms are defined.

The editor has also asked that you submit your guide in format which is suitable for immediate publication. You should therefore consider the following points:

* Title and subtitles.
* Name of author.
* Font size 12 for main text (headings may be bigger).
* All figures include a caption, and are legible (in focus, and a suitable size)
* References should be fully formatted.

The article should:

* Gain the reader’s attention (think about using a ‘catchy’ title and good use of colour).
* Maintain a reader’s interest (clearly arranged so that the guide is easy to follow - avoid vague statements and make sure information is understandable).

Some useful sources:

* RSC video on [recrystallisation](https://edu.rsc.org/resources/recrystallisation/1065.article)
* Chemistry LibreTexts webpage on [recrystallisation](https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Physical_Properties_of_Matter/Solutions_and_Mixtures/Case_Studies/RECRYSTALLIZATION)
* Chemistry (Palgrave Foundation Series) Lewis and Evans   
  Library shelve code: **QD31.2.L3** (viewable online).
* AQA A-level Chemistry 2, McFarland and Henry  
  Library shelf code: **QD33.2 .M2** (viewable online).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Mark** | | | | |
|  | **4** | **3** | **2** | **1** | **0** |
| **Design &** **formatting of guide** | A clearly laid out and eye-catching design. Excellent formatting, i.e., headings used and good-sized figures which contain captions. | A very good attempt made. Appealing layout, some minor formatting errors made. | A satisfactory attempt made. There is room for improvement. | Significant improvement required. | No consideration for formatting made. |
| **Introduction of the technique & explanation of process** | Technique is clearly introduced, and all stages of the procedure are explained with supporting, labelled diagrams. | Generally good description of the technique, but section may include minor errors / omissions. Diagrams may be missing some labels / description. | Some attempt to complete the section. Some statements/ details may require further explanation or may be missing. Greater consideration of diagrams needed. | Limited attempt at completing section. There may be a lot of vague statements or significant details missing. | No attempt to complete section. |
| **Further details on pros & cons and solvent** | Good detail provided on both pros & cons, and on the importance of the solvent. | A good attempt at considering pros and cons, and including info on solvent. May require further explanation. | Missing either pros & cons, or info on solvent. Detail may be limited | Lacks significant detail. | No attempt to complete section. |
| **Language / Pitched for audience** | Good consideration of sentence structure and language used in order to inform and engage the audience. Scientific terms are defined. | A good attempt to pitch for the audience. Text generally flows, and terminology appropriate. | A satisfactory attempt of pitching for the audience. Though may be hard to follow in places | Little effort made to pitch to the target audience. | No or very little consideration of target audience. |
| **References** | Excellent. All references are accurately formatted. This includes intext citations. Some minor formatting mistakes allowed. | References completed to a high standard. Although some mistakes made i.e., a missing reference/in-text citation. | A satisfactory attempt to format references. There may be several errors made throughout the guide. | References poorly/inconsistently formatted and/or in-text citations may be missing. | No or very little attempt of including refences. |
| **Total** | **/20** | | | | |

**Marking Guidance:**

Definitions:

Solute – a substance that dissolved in a solution

Compounds – a substance composed of two or more atoms of different elements.

Solvent – a liquid chemical used for dissolving, dispersing, and diluting compounds.

**What Is Recrystallisation?**

Recrystallisation is a method of purifying an impure substance. It applies the concept that raising temperature increases the quantity of solute dissolved. (Texts, 2021)

**Why is it Used?**

Recrystallisation is used because it is the most important method in purify organic solids, by dissolving them and crystallising them into a more pure compound.

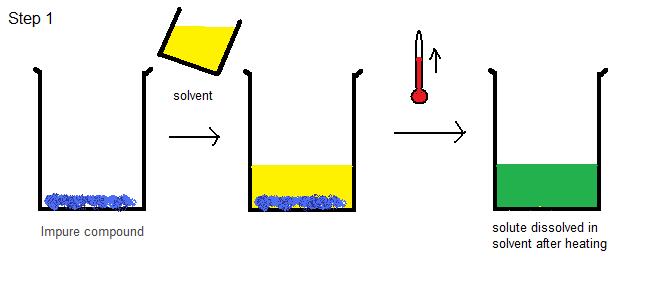
**How does the process of Recrystallisation work?**

Recrystallisation has four main stages:

1. **Identifying the appropriate solvent**

Typically, upon completing a lab on recrystallisation, the most appropriate solvent is identified and provided.

1. **Dissolving the Solute**

The next stage in the process involves dissolving the solute (the impure product) in a small amount of heated solvent. To ensure we use as little solvent as possible, the hot solvent has to be added in small increments, using a pipette, until the solute dissolves. If too much solvent is added, the solution may become too dilute to form any crystals.

1. Graphical user interface, application, Word

   Description automatically generated**Time to Cool the Solution**

Place the beaker containing the dissolved solution on a surface that allows it to cool down slowly, like tissue paper. Also place a light cover over the beaker to prevent loss of solution and contamination. Once at room temperature, the crystals should have formed. Now, create an ice bath and place the beaker inside it to maximise the chance of crystallisation. The beaker should sit in the ice bath for up to an hour, or until its clear no more crystals will form.

1. **Time to Dry**

Graphical user interface

Description automatically generatedPlace the beaker containing the crystals on the worktop and keep the light cover on the beaker. (Franco, 2022) Isolate the crystals by vacuum filtration, using a Büchner Funnel. Now rinse the crystals on the Buchner funnel using a small amount of cold solvent (same one as before) to remove any remaining impurities. The last step involves drying the crystals, this can be done by leaving them in the funnel and turning the vacuum pump on for a few minutes or leave them out in the open for several days. Other More efficient methods are also available.

**Pros:**

The advantage recrystallisation has is that when the appropriate solvent has been found, it becomes a very effective method of purifying a substance.

**Cons:**

Finding the right solvent is by far the most frequent issue with recrystallization because the solvent must be chosen through trial and error, based on assumptions and varied research, this becomes an expensive and time-consuming task. (Texts, 2021)

Another disadvantage is that the cooling process takes a long time.

**The Importance of the Solvent:**

The choice of solvent is crucial in the purifying process.

The solvent should allow the solute to dissolve at very high temperatures but remain insoluble at lower temperature. This is because the impure products should be able to dissolve the impurities within its lattice at high temperature but shouldn’t dissolved at lowers temperatures (even at room temp). This should allow the solid to be recovered.

Also, the solvent shouldn’t react with the solvent.

# References

Franco, L. o. D. J., 2022. *Purifying Compunds by Recrystallisation,* s.l.: Jove, Cambridge.

Talk, C., 2021. Lab Procedure: Recrytallisation. 21 Aug.

Texts, C. L., 2021. Recrystallisation. p. 1.

Check work up to here. Thanks.

Here are some of the criteria of solvent must meet:

* It must not react with the solute. It must readily dissolve.
* It must dissolve at a high temperature. It should be cheap and volatile.

Diagram

Description automatically generatedDiagram

Description automatically generated

Connected to the vacuum line

Connected to the vacuum line

Bibliography:

<https://chemistrytalk.org/recrystallization/>

[Recrystallization - Chemistry LibreTexts](https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Physical_Properties_of_Matter/Solutions_and_Mixtures/Case_Studies/RECRYSTALLIZATION)

[Purifying Compounds by Recrystallization | Organic Chemistry | JoVE](https://www.jove.com/v/10184/purifying-compounds-by-recrystallization#:~:text=Recrystallization%20is%20a%20purification%20technique,pure%20crystals%20grow%20from%20solution.)

**Dissolving the Solute**

**Time to Cool the Solution**

Place the beaker with the dissolved solution on a surface, such as tissue paper, which will allow it to cool down gradually. Additionally, cover the beaker lightly to minimise contamination and solution loss. At normal temperature, crystals are supposed to have developed.

**Time to Dry**

Place the beaker containing the crystal on the work surface, whilst retaining the light cover on the beaker. Utilising a Butcher funnel. Isolate the crystals via vacuum filtering. To get rid of any leftover contaminants, rinse the crystals on the Butcher funnel, using a tiny amount of the cold solvent (same solvent as before). The crystals must be dried in the final phase, which can be accomplished by leaving them in the funnel to draw in air for several minutes. Alternatively, they can be left uncovered for up to days to completely dry. Other more effective methods are also available.