

Tb - Project Proposal

by Thomas Beswick

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**BSc (Hons) Ordnance, Munitions &
Explosives – Research and
Development**

**Project Proposal – Categorising anhydrous and
octahydrate strontium peroxide powders for
pyrotechnics using EBSD and EDX analysis**

**Thomas Beswick – 1910566
10/03/2023**

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Titles for subsections 4.1, 4.2, 4.3 in the Contents do not match the actual text!

1 Introduction

Strontium peroxide generally comes in two forms with varying structures. These are anhydrous and octahydrate. These two forms are differentiated by the presence of water molecules attached to each strontium peroxide molecule [1]. While anhydrous strontium peroxide does not have any additional water attached, octahydrate has eight. In addition to the varying composition, the chemical structures differ slightly. While both have a tetragonal structure, anhydrous has an I4/mmm (Z=2) space group while octahydrate has a P4/ncc (Z=4) space group, as recorded by J. S. Ricci et al and M. Königstein [2] [3]. These differences will allow electron backscatter diffraction (EBSD) techniques to detect the quantities of each structure within a powder.

The purpose of this project is to develop a method of mounting powders for using with EBSD techniques in a scanning electron microscope (SEM). These powders will then be mounted into the SEM and ran through Energy Dispersive X-ray Spectroscopy (EDX) to identify where the concentrations of strontium peroxide are followed by a close-up analysis using EBSD to determine which of the structures are present.

2 Background

Strontium and its various compounds are commonly used with tracer munitions due to the bright red flame it produces when burned. Inside a tracer bullet, there are two types of strontium pyrotechnic composition.

The main constituent is a 'light ignition' compound that burns bright red and produces the trace during flight. The second, smaller, component of the composition is a 'dark ignition'. The dark ignition is used as a delay composition to stop the bright red flame burning within the barrel of the weapon and giving away the location of the firer. NATO Manual of Proof and Inspection [4] requirements also state that tracer ammunition in small arms (5.56mm and 7.62mm) must not be lit prior to 13 meters from the barrel.

Strontium peroxide is a common compound found in these tracer compositions and is regarded as a good oxidising substance for enabling the reaction with Magnesium [5]. However, there is limited information on the behaviours of the two structures of strontium peroxide and how they can affect the performance of tracer pyrotechnic compositions.

3 Aims and Objectives

The following section of this proposal will cover the aims and objectives of the project in order to break down the major components into manageable tasks. These objectives will follow the 'SMART' objectives convention.

The aim of these objectives is to give an overarching plan for the project and will explain the different steps to achieving the end goal.

- Research and review the properties and characteristics of anhydrous and octahydrate strontium peroxide powder and critically appraise their use in pyrotechnic compositions.
- Develop a reliable method to mounting strontium peroxide powders in an SEM.
- Use EDX and EBSD techniques to identify the composition of strontium peroxide powders and determine the structures of the strontium peroxide compounds.

- Draw conclusions on which strontium peroxide structure has more desirable properties for use in pyrotechnic compositions.



4 Experimental Design

4.1 Mounting of Powder

For mounting of the powder, various methods will be tried to achieve the best results in the SEM. This will include using various mounting medium such as acrylic, epoxy or ethy-Methacrylate [6]. Following mounting, the powder will be polished using differing grades of diamond powder.



The quality of each mounting technique will be unable to be analysed until they are used under the EBSD to determine the structures. If the powder is not polished sufficiently or has not been mounted flat, the SEM will be unable to identify the structures within the sample.



4.2 Using EDX to Identify Composition

The EDX technique will be used to get an overall look of the chemicals within the powders. The samples to be used will be various purities of strontium peroxide, ranging from 70% to 96%. This technique will be used to identify the remaining compositions present in the powders.



The EDX results will also be used to identify the high concentration areas of strontium, to zoom in and focus analysis for EBSD in the next section.

4.3 Using EBSD to Determine Strontium Peroxide Structure

Once the optimal setup for the previous two steps has been determined, the final stage will be to analyse the samples for the strontium peroxide structures present in the powders. This will be done using the identification values present on the Oxford Instruments SEM. These values have been provided with references and will be referenced as used in the final report.



The results from each scan will be recorded along with the sample composition to allow for identification of which strontium peroxide sample is used in the final tracer composition. Firing and recording of these results are outside the scope of this project.

5 Resources and Planning

This section of the proposal will discuss the resources required to complete the project and costs associated with these.



5.1 Materials and Costs

The materials required for this project will include those required for mounting the powder for analysis. This will include solvents for suspending the powder, conductive resin for mounting, moulds and conductive stands to fit into the Oxford Instruments SEM. A breakdown of these costs is found in Annex 2

The cost of these materials is already funded via the BAE Systems ECoRN process, given an initial funding of £1,000.

5.2 Human Resources

The main human resource requirement will be the author of this document. Other resources required will be the time of other Radway Green engineers in order to gather knowledge and discuss the methods and technologies being applied during this project.

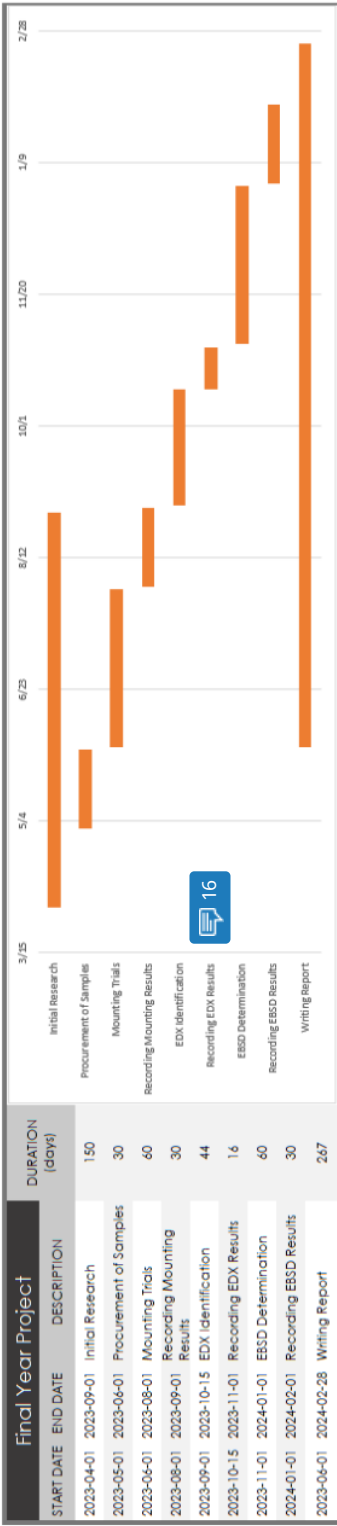
In terms of the time requirement for the author of this document, it is estimated that the total project will take approximately 18 months to complete from the beginning of the 2023 through to March 2024. Within these 12 months, the author will be working full time in addition to completing this project.

5.3 Ethics Form

The ethics form is a requirement of UWTSD and has been filled out and attached at the end of this report in Annex A.

5.4 GANTT Chart

A GANTT chart is used to display the various tasks within a project and can help to identify the critical path of the entire project and therefore the crucial tasks to complete on time. The below GANTT chart was produced in Microsoft Excel.



6 References

- [1] P. A. K. W. H. Philipp, "Synthesis and Thermal Properties of Strontium and Calcium Peroxides," NASA, San Francisco, 1989.
- [2] M. Königstein, "Structural Properties of Nonstoichiometric Barium and Strontium," *Journal of Solid State Chemistry*, vol. 147, p. 478, 1998.
- [3] R. C. S. R. K. M. W. T. K. J. S. Ricci, "Structure of strontium hydroxide octahydrate, $\text{Sr}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$, at 20, 100 and 200 K from neutron diffraction," *STRUCTURAL SCIENCE CRYSTAL ENGINEERING MATERIALS*, vol. 61, no. 4, pp. 381-386, 2005.  17
- [4] North Atlantic Treaty Organisation (NATO), "MULTI-CALIBRE MANUAL OF PROOF AND INSPECTION (M-CMOPI) FOR NATO SMALL ARMS AMMUNITION," NATO STANDARDIZATION OFFICE (NSO), 2020.
- [5] L. C. P. G. C. B. Charles Rosères, "Thermal Behaviour and Kinetic Parameters of Ternary $\text{Mg}+\text{SrO}_2+\text{DNAN}$ Pyrotechnic Compositions," *Propellants, Explosives, Pyrotechnics*, vol. 47, no. 4, 2022.  18
- [6] Agar Scientific, "Materials Embedding," Agar Scientific, [Online]. Available: <https://www.agarscientific.com/sem/specimen-embedding>. [Accessed 23 March 2023].

Annex 1 – Ethics Form

APPLICATION FOR ETHICAL APPROVAL

In order for research to result in benefit and minimise risk of harm, it must be conducted ethically.

The University follows the OECD Frascati manual definition of **research activity**: “creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications”. As such this covers activities undertaken by members of staff, postgraduate research students, and both taught postgraduate and undergraduate students working on dissertations/projects.

The individual undertaking the research activity is known as the “principal researcher”.

This form must be completed and approved prior to undertaking any research activity.

SECTION A: About You (Principal Researcher)

1	Full Name:	Thomas Beswick
2	Student Number:	1910566
3	Email address:	1910566@student.uwtsd.ac.uk
4	Programme of Study:	Ordance, Munitions and Explosives
5	Director of Studies/Supervisor:	Gareth Collett

SECTION B: Internal and External Ethical Guidance Materials

	Please list the core ethical guidance documents that have been referred to during the completion of this form (including any discipline-specific codes of research ethics, location-specific codes of research ethics, and also any specific ethical guidance relating to the proposed methodology). Please tick to confirm that your research proposal adheres to these codes and guidelines. You may add rows to this table if needed.	
1	UWTSD Research Ethics & Integrity Code of Practice	☐
2	UWTSD Research Data Management Policy	☐
3		☐

SECTION C: Details of Research Activity

1	Indicative title:	Categorising anhydrous and octahydrate strontium peroxide powders for pyrotechnics using EBSD and EDX analysis	
2	Proposed start date:	01/04/23	Proposed end date: 24/03/23  19
Introduction to the Research (maximum 300 words in each section) Ensure that you write for a <u>Non-Specialist Audience</u> when outlining your response to the three points below: • <i>Purpose of Research Activity</i> • <i>Proposed Research Question</i> • <i>Aims of Research Activity</i> • <i>Objectives of Research Activity</i> Demonstrate, briefly, how <u>Existing Research</u> has informed the proposed activity and explain • <i>What the research activity will add to the body of knowledge</i> • <i>How it addresses an area of importance.</i>			
3	Purpose of Research Activity To develop methods of analysing strontium peroxide powders to identify the various structures. This will then provide the basis of further research into how this effects performance. (this box should expand as you type)		
4	Research Question Can anhydrous and octahydrate strontium peroxide be identified using EDX and EBSD techniques? (this box should expand as you type)		
5	Aims of Research Activity To develop the methods of analysing strontium peroxide powders in various purities and record data for further research (this box should expand as you type)		
6	Objectives of Research Activity • Research and review the properties and characteristics of anhydrous and octahydrate strontium peroxide powder and critically appraise their use in pyrotechnic compositions. • Develop a reliable method to mounting strontium peroxide powders in an SEM.		

	- Use EDX and EBSD techniques to identify the composition of strontium peroxide powders and determine the structures of the strontium peroxide compounds. - Draw conclusions on which strontium peroxide structure has more desirable properties for use in pyrotechnic compositions (this box should expand as you type)	20
	Proposed data collection methods (maximum 600 words) Provide a brief summary of all the methods that may be used in the research activity to collect data, making it clear what specific techniques may be used. If methods other than those listed in this section are deemed appropriate later, additional ethical approval for those methods will be needed. You do not need to justify the methods here, but should instead describe how you intend to collect the data necessary for you to complete your project.	
7	Data will be collected using trials methods on powders sources by BAE Systems. No personal data will be required.	

SECTION D: Scope of Research Activity

	Will the research activity include:	YES	NO
1	Use of a questionnaire or similar research instrument?	☐	☒
2	Use of interviews?	☐	☒
3	Use of focus groups?	☐	☒
4	Use of participant diaries?	☐	☒
5	Use of video or audio recording?	☐	☒
6	Use of computer-generated log files?	☐	☒
7	Participant observation with their knowledge?	☐	☒
8	Participant observation without their knowledge?	☐	☒
9	Access to personal or confidential information without the participants' specific consent?	☐	☒
10	Administration of any questions, test stimuli, presentation that may be experienced as physically, mentally or emotionally harmful / offensive?	☐	☒
11	Performance of any acts which may cause embarrassment or affect self-esteem?	☐	☒
12	Investigation of participants involved in illegal activities?	☐	☒
13	Use of procedures that involve deception?	☐	☒
14	Administration of any substance, agent or placebo?	☐	☒
15	Working with live vertebrate animals?	☐	☒
16	Procedures that may have a negative impact on the environment?	☐	☒
17	Other primary data collection methods. Please indicate the type of data collection method(s) below.	☐	☒

Details of any other primary data collection method: (this box should expand as you type)		
--	--	--

If you have ticked NO to every question then the research activity is (ethically) low risk and you may skip section E and continue to section F.

If YES to any question, then no research activity should be undertaken until full ethical approval has been obtained.

SECTION E: Intended Participants

Who are the intended participants:		YES	NO
1	Students or staff at the University?	☐	☐
2	Adults (over the age of 18 and competent to give consent)?	☐	☐
3	Vulnerable adults?	☐	☐
4	Children and Young People under the age of 18? (Consent from Parent, Carer or Guardian will be required)	☐	☐
5	Prisoners?	☐	☐
6	Young offenders?	☐	☐
7	Those who could be considered to have a particularly dependent relationship with the investigator or a gatekeeper?	☐	☐
8	People engaged in illegal activities?	☐	☐
9	Others. Please indicate the participants below, and specifically any group who may be unable to give consent.		
Details of any other participant groups: Complete this only if your participants cannot give consent. This includes animals (this box should expand as you type)		☐	☐

Participant numbers and source	
Provide an estimate of the expected number of participants. How will you identify participants and how will they be recruited?	
10	How many participants are expected? Ballpark figures are fine, but make sure that you explain how you will identify and contact your participants.

		(this box should expand as you type)
11	Who will the participants be?	(this box should expand as you type)
12	How will you identify the participants?	(this box should expand as you type)

	Information for participants:	YES	NO	N/A
13	Will you describe the main research procedures to participants in advance, so that they are informed about what to expect?	☐	☐	☐
14	Will you tell participants that their participation is voluntary?	☐	☐	☐
15	Will you obtain written consent for participation?	☐	☐	☐
16	Will you explain to participants that refusal to participate in the research will not affect their treatment or education (if relevant)?	☐	☐	☐
17	If the research is observational, will you ask participants for their consent to being observed?	☐	☐	☐
18	Will you tell participants that they may withdraw from the research at any time and for any reason?	☐	☐	☐
19	With questionnaires, will you give participants the option of omitting questions they do not want to answer?	☐	☐	☐
20	Will you tell participants that their data will be treated with full confidentiality and that, if published, it will not be identifiable as theirs?	☐	☐	☐
21	Will you debrief participants at the end of their participation, in a way appropriate to the type of research undertaken?	☐	☐	☐
22	If NO to any of above questions, please give an explanation			
	You should be able to tick YES for all of these questions. If not, then explain why not in this box. (this box should expand as you type)			

	Information for participants:	YES	NO	N/A
24	Will participants be paid?	☐	☐	☐

25	Is specialist electrical or other equipment to be used with participants?	☐	☐	☐
26	Are there any financial or other interests to the investigator or University arising from this study?	☐	☐	☐
27	Will the research activity involve deliberately misleading participants in any way, or the partial or full concealment of the specific study aims?	☐	☐	☐
28	If YES to any question, please provide full details			
You should be able to tick NO for most of these questions. For any cases that you have ticked YES then provide details in this box. If you are using cameras/voice recorders to record interviews then please state that in this box. (this box should expand as you type)				

SECTION F: Anticipated Risks

7	8	Outline any anticipated risks that may adversely affect any of the participants, the researchers and/or the University, and the steps that will be taken to address them.	
Risks to participants 1 For example: sector-specific health & safety, emotional distress, financial disclosure, physical harm, transfer of personal data, sensitive organisational information. If you have identified in section D that there are no participants then enter N/A and go skip to question 3.			
Risk to participants: N/A  (this box should expand as you type)		How you will mitigate the risk to participants: (this box should expand as you type)	
2 If research activity may include sensitive, embarrassing or upsetting topics (e.g. sexual activity, drug use) or issues likely to disclose information requiring further action (e.g. criminal activity), give details of the procedures to deal with these issues, including any support/advice (e.g. helpline numbers) to be offered to participants. Note that where applicable, consent procedures should make it clear that if something potentially or actually illegal is discovered in the course of a project, it may need to be disclosed to the proper authorities			
N/A (this box should expand as you type)			
Risks to the investigator 3 For example: personal health & safety, physical harm, emotional distress, risk of accusation of harm/impropriety, conflict of interest			

	Risk to the investigator: Risk of exposure to strontium peroxide powder (this box should expand as you type)  23	How you will mitigate the risk to the investigator: BAE Systems safe systems of work will be in place to ensure gloves, masks or other protective equipment is worn when handling powders. (this box should expand as you type)
4	University/institutional risks For example: adverse publicity, financial loss, data protection	
	Risk to the University: Work-based project reduces risk to university. (this box should expand as you type)	How you will mitigate the risk to the University: (this box should expand as you type)
5	Environmental risks For example: accidental spillage of pollutants, damage to local ecosystems	
	Risk to the environment: Strontium peroxide powders are damaging to the environment. (this box should expand as you type)	How you will mitigate the risk to environment: BAE Systems safe systems of work will be in place to ensure disposal, or spillages of the substance will be cleaned and disposed of in the correct manner. Radway Green has an on site environmental chemist to ensure damage to the environment is avoided. (this box should expand as you type)

SECTION G: Feedback, Consent and Confidentiality

If you have identified in section D that there are no participants then enter skip this section and continue to section H.

1	Feedback What de-briefing and feedback will be provided to participants, how will this be done and when?
	You don't need to email your participants with your final report. A good alternative is to set up an email address that they will be able to contact for further details or results. (this box should expand as you type)
2	Informed consent Describe the arrangements to inform potential participants, before providing consent, of what is involved in participating. Describe the arrangements for participants to provide full consent before data collection begins. If gaining consent in this way is inappropriate, explain how consent will be obtained and recorded in accordance with prevailing data protection legislation.

	If you are using a paper questionnaire then you should have the participants sign an appropriate consent form. These forms will count as personal data and should be noted as such in section J. If you are using an online questionnaire, then you should have a screen before the questions start that acts as a consent form, informing participants that by clicking on the NEXT button they are providing consent. (this box should expand as you type)
3	Confidentiality / Anonymity Set out how anonymity of participants and confidentiality will be ensured in any outputs. If anonymity is not being offered, explain why this is the case.
	Do not collect names unless you really need them. Do not name participants or organisations in any research publications (including the thesis) without their explicit permission. (this box should expand as you type)

SECTION H: Data Protection and Storage

	Does the research activity involve personal data (as defined by the General Data Protection Regulation 2016 "GDPR" and the Data Protection Act 2018 "DPA")?	YES	NO
1	"Personal data" means any information relating to an identified or identifiable natural person ('data subject'). An identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person. Any video or audio recordings of participants is considered to be personal data.	☐	/
	If YES, provide a description of the data and explain why this data needs to be collected:		
2	This includes audio/video data of participants, but can also include IP addresses and usernames. Names, addresses and emails also count, as do consent forms. (this box should expand as you type)		
	Does it involve special category data (as defined by the GDPR)?	YES	NO
3	"Special category data" means sensitive personal data consisting of information as to the data subjects' – (a) racial or ethnic origin, (b) political opinions, (c) religious beliefs or other beliefs of a similar nature, (d) membership of a trade union (within the meaning of the Trade Union and Labour Relations (Consolidation) Act 1992), (e) physical or mental health or condition, (f) sexual life, (g) genetics, (h) biometric data (as used for ID purposes),	☐	/
	If YES, provide a description of the special category data and explain why this data needs to be collected:		
4	What counts as 'sensitive' will differ between cultures. Any information on behaviour that is not in accordance with cultural norms would count as sensitive personal data.		

	<i>(this box should expand as you type)</i>
--	--

	Will data from the research activity (collected data, drafts of the thesis, or materials for publication) be stored in any of the following ways?	YES	NO
5	Manual files (i.e. in paper form)?	☐	☒
6	University computers?	☐	☒
7	Private company computers?	☒	☐
8	Home or other personal computers?	☒	☐
9	Laptop computers/ CDs/ Portable disk-drives/ memory sticks?	☐	☒
10	"Cloud" storage or websites?	☐	☒
11	Other – specify:	☐	☒
12	For all stored data, explain the measures in place to ensure the security of the data collected, data confidentiality, including details of backup procedures, password protection, encryption, anonymisation and pseudonymisation: <i>No personal data will be collected for this research activity.</i> <i>Any technical data collected will be stored on a password protected computer. Data stored on private company computers are password protected and encrypted.</i> <i>(this box should expand as you type)</i>		

Data Protection			
	Will the research activity involve any of the following activities:	YES	NO
13	Electronic transfer of data in any form?	☐	☒
14	Sharing of data with others at the University outside of the immediate research team?	☐	☒
15	Sharing of data with other organisations?	☐	☒
16	Export of data outside the UK or importing of data from outside the UK?	☐	☒
17	Use of personal addresses, postcodes, faxes, emails or telephone numbers?	☐	☒
18	Publication of data that might allow identification of individuals?	☐	☒
19	If YES to any question, please provide full details, explaining how this will be conducted in accordance with the GDPR and Data Protection Act (2018) (and/or any international equivalent):		

	This includes data such as drafts of your thesis as well as experimental or survey data. An example of suitable text is given below. <i>All data will be encrypted and kept in password protected cloud storage on the University Office 365 system which will not be shared. Any USB sticks used to store or transfer data will be password protected. All data transfers will be encrypted and password protected. All participants will be given a unique identifier to ensure confidentiality and this list will be kept securely in the password protected folder. The data will be stored until the completion of the project and then deleted. In accordance with the DPA2018, participants will have the right to ask to see what data is held relating to them, and this data will be deleted immediately if the participant requests this, in which case the data will not be used in the project.</i> <i>(this box should expand as you type)</i>	
20	List all who will have access to the data generated by the research activity:	
	Thomas Beswick, project supervisor and BAE Systems experts. No personal data is required. <i>(this box should expand as you type)</i>	
21	List who will have control of, and act as custodian(s) for, data generated by the research activity:	
	Thomas Beswick <i>(this box should expand as you type)</i>	
22	Give details of data storage arrangements, including security measures in place to protect the data, where data will be stored, how long for, and in what form.	
	<i>All data will be encrypted and kept in password protected cloud storage on the University Office 365 system which will not be shared. Any USB sticks used to store or transfer data will be password protected, and will be reformatted at the end of the project in order to destroy the data. The data will be stored until the completion of the project and then deleted.</i> <i>(this box should expand as you type)</i>	
22	Confirm that you have read the UWTSD guidance on data management (see https://www.uwttd.ac.uk/library/research-data-management/)	☒
23	Confirm that you are aware that you need to keep all data until after your research has completed or the end of your funding	☒

SECTION I: Declaration

	The information which I have provided is correct and complete to the best of my knowledge. I have attempted to identify any risks and issues related to the research activity and acknowledge my obligations and the rights of the participants. In submitting this application I hereby confirm that I undertake to ensure that the above named research activity will meet the University's Research Ethics and Integrity Code of Practice which is published on the website: https://www.uwtsd.ac.uk/research/research-ethics/		
1	Signature of applicant:	Thomas Beswick	Date: 20/03/2023
2	Director of Studies/Supervisor:		Date:
3	Signature:		

FOR INTERNAL USE ONLY:

	Ethical approval given		
1	Signature of assessor:		Date:
2	Name:		
3	Role:		

Annex 2 – Cost Breakdown

Material	Cost	Use	URL
Acrylic Cold Mounting Resin	£ 43.63	Mounting	https://www.agarscientific.com/sem/specimen-embedding/acrylic-cold-mounting-resin-601-2
Epoxy Cold Mounting Resin	£ 44.07	Mounting	https://www.agarscientific.com/sem/specimen-embedding/cold-mounting-resins-for-mounting-machines-epoxy
Methy-Mathacrylate Cold Mounting Resin	£ 70.64	Mounting	https://www.agarscientific.com/sem/specimen-embedding/methyl-methacrylate-cold-mounting-resin-605
Diamond Polishing Paste	£ 26.46	Polishing	https://www.agarscientific.com/sem/grinding-polishing/kemet-diamond-polishing-paste

Abrasive Strips - Diamond	£ 15.56	Polishing	https://www.agarscientific.com/sem/grinding-polishing/abrasive-strips-7230
Specimen Stubs	£ 32.55	Mounting	https://www.agarscientific.com/sem/specimen-stubs-mounts/serialised-sem-pin-stubs-with-pre-mounted-tabs
Total	£ 232.91		

Annex 3

Tb - Project Proposal

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

46/100

Intro / Aim & Objectives (150 words) 176+131		
<i>Project title. Identification of a specific problem to be investigated. Well-defined aims and SMART objectives.</i> <i>Explaining why this project is worth doing. Discussion of what the project needs to do to be a success.</i> <i>Description of any deliverables that will be produced at the end of the project</i> Good, informative title but does not correspond to the purpose described in Introduction. The title talks about 'categorising' and the purpose of mounting. The aim of the project is provided ('mounting of SrO2 for EBSD analysis') but the specific problem is not identified (why do you want to do it?) The aims and objectives are mixed. Objectives are not SMART There are no arguments supporting the importance of this project nor discussion of what should be done for this project to be successful What results are you expecting to achieve?	20	10
Background to the Project / Literature Review (450 words) 174		

<i>Description of how the work to be done in the project relates to the work identified in the literature review. Discussion of any ethical issues raised by the project Identifying what has already been done within the field. Topic familiarity. Brief literature review using appropriate sources – 6-8 journal papers and book chapters rather than just websites. Selection of relevant models & concepts.</i> You did not discuss any literature related to your proposed project. Who/what/how did something related to your proposed research? Significantly below recommended word count. You must expand this section in your actual project. There is no discussion of any ethical issues I would suggest a more extensive literature search to become more familiar with the topic. Very limited literature review.	20	8
Project Design (200 words) 271		
<i>Clear statement of which development methods are to be used and why they are appropriate.</i> <i>A clear statement of which tools are to be used and why they are appropriate.</i> <i>A clear description of how data collected will be analysed</i>	30	10

Right experimental methods are proposed to be used but they need an explanation of why appropriate There is no information on how the collected data will be analysed.		
Resources / Planning (200 words) 180		
<i>List of any deliverables. Clear diagram showing both timing and resource use. Completed ethics form.</i> <i>Limited and relevant appendices</i> Deliverables are listed but more explanation would be needed A detailed Gantt chart is provided but the Inclusion of key milestones would be useful. The use of resources is not clear in this chart The aims and objectives in Ethics Form are slightly different than those in the text.	15	8
Document Presentation		
<i>Project title. Identification of a specific problem to be investigated. Well-defined aims and SMART objectives.</i> <i>Explaining why this project is worth doing. Discussion of what the project needs to do to be a success.</i> <i>Description of any deliverables that will be produced at the end of the</i>	15	10

<i>project</i> Mostly correct spelling, grammar, and punctuation. Usw Editor or Grammarly for further improvement. Relatively fluent and mostly coherent read. The title page includes all the necessary information Subsections 4.1, 4.2 1st 4.3 have different titles in the Table of content and the text.		
TOTAL	100	46

PAGE 1

PAGE 2

Text Comment. 7 Annex 1 - Ethics Form 8 Annex 2 - Cost Breakdown

Text Comment. Titles for subsections 4.1, 4.2, 4.3 in the Contents do not match the actual text!

PAGE 3



Comment 1

...with varying chemical composition, not structure.



Comment 2

would be good to show these structures /compositions?



Comment 3

why are you specifically interested in mounting? are there any issues with this step reported in literature or special requirements? limitations?



Comment 4

what do you expect to see exactly?



Comment 5

How is this relevant to your project?



Comment 6

this sentence is not necessary here; it only increases word count without providing relevant informatuion. It is clear from the title of section 3 that you are going to state the aims and objectives. it will also be apparent if they are SMART or not.



Comment 7

there is the aim of the project (not objectives) and objectives are the steps to achieve this aim.

this sentence is not grammatically correct



Comment 8

this is the goal of this project; your aim.

research and review... and use EDX and EBDS... are the objectives necessary to achieve the goal

these objectives are not SMART!

PAGE 4



Comment 9

I am not quite sure, how can you conclude from EBSD analysis which structure is more useful in pyro. this should be better explained

Text Comment. will



Comment 10

what results specifically do you expect to achive?



Comment 11

Methyl methacrylate (MMA)



Comment 12

Why?



Comment 13

What chemicals? what are the impurities?



Comment 14

what are these 'identification values'?



Comment 15

this sentence is not needed here; again it only contributes to the word count, not the content

PAGE 5

PAGE 6



Comment 16

EDX and EBSD results must be recorded at the same time!

PAGE 7



Comment 17

wrong authors' names



Comment 18

error in authors' names

PAGE 8

PAGE 9



Comment 19

2024

PAGE 10



Comment 20

the purpose differ from your aim described in the proposal.

missing parts: discussion of existing research and importance of your proposed project



Comment 21

too short

PAGE 11

PAGE 12

PAGE 13



Comment 22

What about risks and safety aspects when using SEM?

PAGE 14



Comment 23

what about exposure to ionising radiation, electrical hazard, vacuum system, other chemicals?

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