

GENERAL LABORATORY RISK ASSESSMENT

1. General information.

Department:	Chemical Engineering	Date:	November 22, 2022
Procedure:	Solvothermal reactions using Parr Vessels	Revision Number:	1
Principal Investigator:	Johnny B Good	PI Phone Number:	88888
PI Signature: *By signing you are indicating that the tasks are planned for in such a way that the risk is tolerable. <div style="text-align: right; margin-right: 100px;"> X _____ </div>			

2. Identify if any of the following hazards or materials are present.

<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Nanomaterials	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Cannabis
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Biohazards	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Nonionizing Radiation
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Radioactive materials	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Designated Substances (acrylonitrile, benzene, silica, isocyanates, vinyl chloride, As, Pb, Hg, etc.)
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	X-ray sources		
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Class 3B or Class 4 Lasers		

If you checked “yes” for any of the items above, review the associated program to ensure you have managed those requirements prior to or in conjunction with completing this risk assessment.

3. Describe the project steps in point form detail. Identify equipment and materials at relevant steps.

<ol style="list-style-type: none"> 1. Load the 2 grams of Graphene Oxide and 50 mL of ethylene glycol in the Parr reactor vessel. Note - The reactant volume should not exceed 70% of the chamber volume. If the proposed volume exceeds this percentage, obtain a larger reactor or decrease sample size. 2. Assemble the reactor (see the diagram on the SOP for a list of components) and tighten (which may need a benchtop clamp and/or stainless-steel rod (for 50 mL and larger)). 3. Starting temperature of the reaction must be below 40 °C. 4. Prepare the MTI Gravity Oven program, ensuring that all program steps of the previous experiment is erased (refer to the oven SOP for details). Oven temperature should be set for 180 °C with a maximum temperature rise of 50 °C/min. 5. Ensure proper closure and lockage of the oven door. 6. After all the requirements are met, begin the heating process. 7. Check oven regularly during the experiment to ensure proper functioning of the equipment. 8. Once oven program is complete, allow reactor to cool to 30 °C before removing. Allow to cool naturally.
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4. Identify the WHMIS hazard classes, categories, and anticipated control measures used to reduce worker exposure. (Hover mouse here to learn how to add more rows)

Name of chemical	List all WHMIS physical and health hazard classes and categories (drop-down list and free-form text)	Category / Type	Using WHMIS precautionary statements as a guide, identify what control practices are required to minimize worker exposure for handling these chemicals – consider ventilation, PPE, containment, etc.
Ethylene Glycol	Acute toxicity - oral	4	1. Avoid Ingestion 2. Wear protective clothing/gloves – check compatibility
	Specific target organ toxicity - repeated exposure (list organs) - Kidneys	2A	
	Choose an item.	Choose item.	
	Choose an item.	Choose item.	
	Choose an item.	Choose item.	
Graphene Oxide	Not considered hazardous by SDS – however SDS does indicate it is a respiratory tract irritant	Choose item.	Avoid inhalation – use local ventilation, enclosure or create a stock solution in a containment device
	Choose an item.	Choose item.	
	Choose an item.	Choose item.	

5. List equipment being used.

Equipment used consists of devices that impart energy or contain reactions – examples include rotovaps, ovens, pressure devices, material test stands etc. ([Hover mouse here to learn how to add more rows](#))

Identify equipment (Click box to enter text)	Step #	List Potential Equipment Hazards	Identify anticipated controls to control the identified risks
Oven	6-8	Fire	Chemical should not be heated above their flashpoints. Flashpoint of ethylene glycol is 111 C. Oven to be ESA certified. PPE to prevent burns.
		Source of heat - potential burns	
		Choose an item or enter text.	
Parr Reaction Vessel	6-8	High pressure release	While under pressure, contents will release in vapour form. If heated the materials will release at the temperature heated.
		Choose an item or enter text.	
		Choose an item or enter text.	

6. Hazardous conditions.

Please identify how experimental conditions (pressure, temperature, humidity, etc.) may alter the behaviour of chemicals being used. Remember to consider reactive intermediates as well.

Oven compatibility should be checked with flashpoint of materials. Oven is being run at 180 C, and flashpoint of ethylene glycol is 111 C. Unless the oven is rated for flammable items, a different method of heating the reactor vessel will need to be determined.

7. Managing hazardous waste.

Please include waste disposal methods in your SOPs. Guidance can be found on the [Hazardous Waste website](#) or by emailing esf@uwaterloo.ca. (Hover mouse here to learn how to add more rows)

Contents and Anticipated Class		Waste Type	Anticipated Amount
Ethylene Glycol contaminated with graphene oxide nanoparticles		<input type="checkbox"/> Solid <input type="checkbox"/> Radioactive <input type="checkbox"/> Biological <input checked="" type="checkbox"/> Liquid <input type="checkbox"/> Battery <input checked="" type="checkbox"/> Chemical	100 mL
		<input type="checkbox"/> Solid <input type="checkbox"/> Radioactive <input type="checkbox"/> Biological <input type="checkbox"/> Liquid <input type="checkbox"/> Battery <input type="checkbox"/> Chemical	
		<input type="checkbox"/> Solid <input type="checkbox"/> Radioactive <input type="checkbox"/> Biological <input type="checkbox"/> Liquid <input type="checkbox"/> Battery <input type="checkbox"/> Chemical	
		<input type="checkbox"/> Solid <input type="checkbox"/> Radioactive <input type="checkbox"/> Biological <input type="checkbox"/> Liquid <input type="checkbox"/> Battery <input type="checkbox"/> Chemical	
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	All necessary labels, containers, transportation means are available to start the research process.		
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	All waste generators have taken the online Chemical Waste Segregation SO2070		

8. Standard operating procedures and emergency planning.

All medium to high-risk activities require an SOP. Work with toxic, pyrophoric, or water reactive materials require emergency planning SOPs. Identify what SOPs will be created for this project in the table below and where they are located. [SOP template is available from the Safety Office](#).

SOP Name	Procedure available	Indicate how this SOP covers anticipated risks
Overall Process	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	An SOP has been developed outlining how to perform the process and handle the chemicals
Spill, Exposure, or Emergency	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Our general laboratories spills response plan considered spills of organic solvents
	<input type="checkbox"/> Yes <input type="checkbox"/> No	

9. Personal protective equipment.

Note: Closed toed shoes and lab coat are mandatory for work with chemicals.

PPE Type	PPE Storage Location	When it is Worn
Safety Glasses	Adjacent to entry door	All chemical work
Heat resistant gloves	Besides oven	When removing contents from oven

10. Supervisor commentary.

Equipment review should be completed to ensure heating device is compatible with chemicals prior to being used.

11. Worker sign-off.

By signing the sheet below, you acknowledge that you have:

1. Understood the stipulations, hazardous, and control requirements outlined in this document.
2. You have completed practical training and had the opportunity to ask questions

Name (Print)	Signature	Date