# Safety Questionnaire 2025

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| Researcher: | Camden da Silva | | | | | | | | | Status: (BSc, MSc, PhD, external) | | | | | | | BASc | | | |
| McGill ID: | 261139553 | | | | | | | | | E-mail: | | | [camden.dasilva@mail.mcgill.ca](mailto:camden.dasilva@mail.mcgill.ca) | | | | | | | |
| Laboratory #: |  | |  | | | Office: | | | | 6250 | | |  | Tel. (Mobile): | | | | | 442 | |
| Research Director: | | Reghan Hill | | | | | | | |  | | |  | Tel. (Home): | | | | | (705) 351-3535 | |
| Title of Research Project: | | | Dsf Autonomous Protocol for LbL deposition of Polyelectrolyte Films | | | | | | | | | | | | | | | | | |
| WHMIS Training: | | No: |  | Yes: | Checkmark | | | Date Completed: | | | | | 06/02/2025 | |  | | | | | |
| Gas Cylinder Training: | | No: |  | Yes: | Checkmark | | | Date Completed: | | | | | 23/01/2025 | |  | | | | | |
| Other training: | |  | | | | | | Date Completed: | | | | | dd/mm/yyyy | | (e.g., Waste disposal, BSC) | | | | | |
| Expected start and end dates for experiments: | | | | | | | | | 17/02/2025 | | | – | 25/04/2025 | |  | | | | | |
| How often have you done the experiment/procedure? | | | | | | | | | | | | | n/a | | Note: Minimum twice!! | | | | | |
| Has anyone in your research group used this procedure before? If so, please indicate who & when below: | | | | | | | | | | | | | | | | | | | | |
| Researcher | | | | | | | | | | | Approximate Date of Experiments | | | | | | | | | |
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| I certify that all the information in this safety questionnaire is true to the best of my knowledge. Another questionnaire will be submitted if there are significant changes to equipment or experimental procedures. | | | | | | | | | | | | | | | | | | | | |
| Researcher: | | Camden da Silva | | | | |  | | | | | | | | |  | | Date: | | 13/02/2025 |
| Research Director | |  | | | | |  | | | | | | | | |  | | Date | | dd/mm/yyyy |
| Lab Safety Officer: | | (Print Name) | | | | |  | | | | | | | | |  | | Date: | | dd/mm/yyyy |

# Approval Flow Sheet (ONLY for SAFETY COMMITTEE)

**Preliminary Stage**

We, the undersigned, have read the questionnaire and deem the procedure ready for the certification stage under the condition that any comments or recommendations will be considered by the above-named researcher.

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| Safety Committee Member |  |  | Date: |  |
| Safety Committee Member |  |  | Date: |  |
| Safety Committee Member |  |  | Date: |  |

**Certification Stage**

I, the undersigned, certify that a demonstration of the experimental procedure and equipment operation has been performed in my presence by the researcher and that both appear safe.

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| --- | --- | --- | --- | --- |
| Safety Committee Member |  |  | Date: |  |
| Research Director : |  |  | Date: |  |

# Experimental Procedure (max 2 pages, focus only on safety related aspects)

The procedure will consist of three main sources of potential safety concerns: mechanical safety, electrical safety, and chemical safety. Starting with mechanical safety, there are a few things to address. Firstly, an optomechanical structure will be built. This will involve screwing metal components together and potentially drilling through components to fit them correctly. The safety concern with this is the use of power tools. To mitigate this risk, all major drilling through components will be done through a work order in the machine shop, the rest will be done in-lab, with proper care and PPE required (lab coat, glasses, and gloves). Next for mechanical safety, there will be many moving components, including a DC motor, a linear actuator, and a syringe pump. Due to all these moving components, the structure must be built very sturdy. There will be rubber to use as a vibration dampener which will minimize the structure from shaking. Moreover, It will be required for all personnel to keep a distance away from the structure when all components are in motion. Avoiding anyone touching the components will minimize pinching and cutting hands/fingers that would otherwise occur. Next, is electrical safety. Some important considerations to make include loose electrical connections or exposed wires, having solution or other liquids splashed on hands when handling electronics, or leaving the power on when not in use. All of these can be addressed with the following implementations: ensuring that all wires are properly grounded and connected to their appropriate locations before connecting to power, keeping a towel nearby to use to dry hands each time the wiring is handled, and implementing a strict routine of disconnecting power when not in use. Moreover, all of the current ratings for each of the connection devices (such as the ESC) have been bought in accordance with the current drawn by the components they connect to, reducing the possibility of any fires due to overloading the devices. By taking these few steps the risk of electronic failure is reduced significantly. For chemical safety, the main solution that is expected to be used is a non-toxic diluted polymer solution. Because of its non-toxic nature, there are not many concerns about chemical safety and proper disposal of the chemical.  Other measures that will be put in place are as follows: there will be an emergency stop implemented in the code so that if a command is sent or an analog switch/button is pressed, all routines will halt immediately. Testing each of the components will start at a slow pace to ensure precision. There will be detailed documentation kept of all the software and hardware to ensure repeatability and if someone else plans to use the design.

# Simplified P&ID

Mandatory for setups with gas cylinders, mass flow controllers, rotameters, valves, temperature controller, furnace, etc. Add equipment number see in example below (to be deleted)



# Hazards / Precautions

In the table below, check the appropriate box for each hazard class, to classify the severity of the hazard in your experimental procedure. If any box is checked other than **NONE**, list the hazard in the space below and on the other side of the page, if necessary, and describe how you propose to handle the hazard as well as the safety precautions you will take.

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| --- | --- | --- | --- |
| **Hazard Class** | **Potential Hazard Rating** | | |
|  | **None** | **Moderate** | **Severe** |
| Flammable Gases, Liquids or Solids | Checkmark |  |  |
| Toxic and/or Corrosive Gases or Solids | Checkmark |  |  |
| Toxic and/or Corrosive Liquids | Checkmark |  |  |
| High or Low Temperatures | Checkmark |  |  |
| High Pressures or Reduced Pressures (Vacuum) | Checkmark |  |  |
| Electromagnetic Interference or High Energy Laser | Checkmark |  |  |
| Steam | Checkmark |  |  |
| Radioactive Substances | Checkmark |  |  |
| Voltages >115 V or Currents >15 amps |  | Checkmark |  |
| Pathogenic Organisms | Checkmark |  |  |
| High Speed Rotating Machinery |  | Checkmark |  |
| Dangerous Chemical Reactions | Checkmark |  |  |
| Other Hazards | Checkmark |  |  |

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| --- | --- | --- |
| **Chemical /Equipment** | **Potential Hazard Description** | **Hazard Handling and Safety Precautions** |
| **Brushless DC Motor** | Motor datasheet claims to, at max RPM, draw 40 A and spin at 12,000 RPM. High currents can cause components to melt if they are not rated for the correct amount of current. High RPMs come with high centrifugal forces, constantly pulling at the components that keep it in place. | The motor will be tested, we do not believe we need such high power. In case we do, the ESC (used to connect the motor to power and a controller) is rated for 40 A. So if max power is needed, there will not be the risk of overheating the ESC and catching fire.  This motor also spins at very high RPM. It must be securely mounted to the optomechanical breadboard to prevent it from falling off when at high speeds. All personnel will be required to stay at least a metre from the motor when it is in motion to mitigate risk if something were to come off the motor. |
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