Risk Assessment Form (3)

Must be completed before experimentation.

Student's Name(s) Jaekeun Sung

Title of Project Hybrid Artificial Muscle Robot(HAMR): Exosuit Building Block

To be completed by the Student Researcher(s) in collaboration with Designated Supervisor/Qualified Scientist:
(All questions must be answered; additional page(s) may be attached.)

1. List all hazardous chemicals, activities, or devices that will be used; identify microorganisms exempt from pre-approval (see Potentially Hazardous Biological Agent rules).

   Hydrogen Peroxide 3%, Sulfuric Acid 0.02N(0.01M), and Vacuum Pumps.
   Possible unexpected outcomes from testing prototypes such as short circuit fire.

2. Identify and assess the risks involved in this project.

   Please check the additional pages for the details.

3. Describe the safety precautions and procedures that will be used to reduce the risks.

   Please check the additional pages for the details.

4. Describe the disposal procedures that will be used (when applicable).

   Please check the additional pages for the details.

5. List the source(s) of safety information.

   Please check the additional pages for the details.

To be completed and signed by the Designated Supervisor (or Qualified Scientist, when applicable):
I agree with the risk assessment and safety precautions and procedures described above. I certify that I have reviewed the Research Plan/Project Summary and will provide direct supervision.

Carol Hersh	Carol Hersh	3/19/19
Designated Supervisor's Printed Name	Signature	Date of Review (mm/dd/yy)

Teacher, Great Neck South	chersh@greatneck.k12.ny.us
Position & Institution	Phone or email contact information

Ph.D. in chemistry, 23 years teaching science research chemistry
Experience/Training as relates to the student's area of research

Risk Assessment Form Additional Page
Jaekeun Sung

2. Identify and assess the risks involved in this project.

- Sulfuric acid(0.02N)
  - Potential Hazards
    - May cause irritation to the respiratory tract.
    - Contact with skin causes burns and irritation.
    - Ingestion may cause permanent damage to the digestive tract.
- Hydrogen Peroxide(3%)
  - Potential Hazards
    - Potential to cause fire or explosion
    - May cause burns to digestive and respiratory tract
    - May cause nausea, vomiting diarrhea, damage to the red blood cell
    - May cause skin and eye burns.
    - May cause central nervous system effects
- Vacuum Pumps
  - Short Circuited fire
  - Oil leakage

3. Describe the safety precautions and procedures that will be used to reduce the risks.

- Sulfuric acid(0.02N)
  - Safety precautions/minimize risk
    - Respiratory protection
    - Hand protection
    - Eye protection
    - Skin and Body protection
    - Keep it away from combustible materials
- Hydrogen Peroxide(3%)
  - Safety precaution/minimize risk
    - Respirator protection
    - Hand protection
    - Eye protection
    - Skin and Body Protection
    - Store at the tightly closed in a dry and well-ventilated area.
    - Store away from the combustible materials
- Vacuum
  - Physical
    - Electric wires are free from defects
    - Do not place pumps in unventilated area
    - Do not operate pumps near flammable materials
    - Use correct or approved wire for vacuum pumps
  - Chemical
    - Always check valve for oil leakage
    - Put pots to collect potential oil leakage
    - Change oil frequently
    - Vent the pump properly
  - Personnel/supervision
    - Conduct operations behind a table shield and always wear protection gears(safety goggles, lab coat, and gloves)
    - Keep check the condition of pump

4. Describe the disposal procedures that will be used (when applicable).

- Sulfuric acid(0.02N)
  - Disposable method
    - Store it in a closed system.
    - Hand it to the proper waste facility.
- Hydrogen Peroxide(3%)
  - Disposable method
    - Store it in closed container
    - Then send to the proper waste facility.

- Vacuum
  - dispose it based on local guidelines
  - Send it to the proper waste facility

5. List the source(s) of safety information.

- University of Texas at Austin Environmental Health & Safety
- Center For Disease Control
- World Health Organization