

HARDWARE REPORT

Evan Gong / iGEM / 6.14.2025

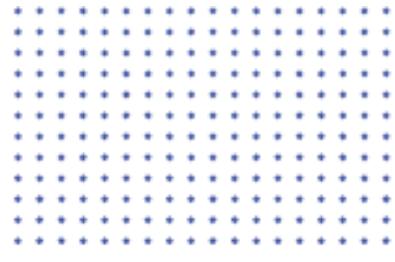




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INTRODUCTION

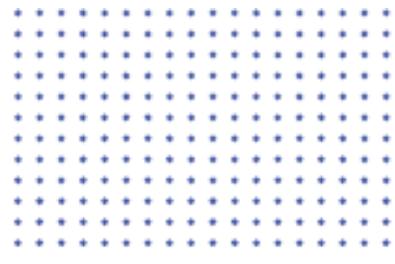


Glove Box commonly used in biology experiments to prevent the materials from leaking. The glove box I designed is aiming to create a environment for PFAS experiments to prevent it from floating in the air and causing pollution.



Picture from 雷伯斯儀器有限公司, <https://rebers.com.tw/product/壓克力密閉手套箱/>

PROBLEM & SOLUTION



Problem

We are doing a PFAS experiment and PFAS can hurt the human body when it is in the air. As a result, we need a container to do experiments in it in order to keep the harmful elements in it. Moreover, we only got about 1000 RMB, so we don't have enough money to buy a glove box, and we need to make a glove box by ourselves instead.

Solution

We decided to let me make a glove box. The glove box should first be safe and do not let the PFAS, PFOA and other harmful materials leak. I need a transition chamber to prevent leaking when delivering things into the glove box. I also need a cleaning device to clean the glove box. I need some device to keep the glove box clean to ensure that no other factors can affect the experiment. We will do the experiments in the glove box so that the harmful materials won't get out.

STRUCTURE DESIGN

In order to make the main body of the glove box, I decided to use some transparent acrylic boards to make the main body and the transition chamber. I will design the boards with holes and send it to the acrylic board custom manufacturers, and they will make the boards for me.

A LED light strip in the main body of the glove box is used to light up the box so the operator can do the experiment clearly.

To make the environment in the glove box sterile, a LED UV light strip is needed to kill all bacteria to reduce factors that would affect the experiment.

There will be an air pump outside the glove box with a tube connected to its main body and it will pump the air out of the box and create a negative pressure environment to prevent leaking.

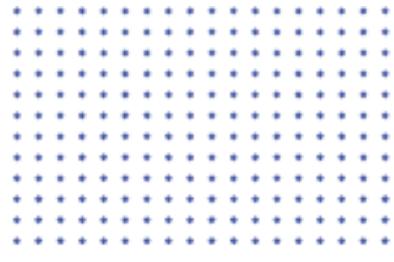
**Glove Box = Acrylic Boards +
Electronic Devices + Tubes +
Flange + Glove**

Two holes are in the front of the glove box and two flanges are attached to the hole with gloves on them. Operators use gloves to do the experiment.

A water pump with tubes connected to the glove box can pump water into the glove box, and the tubes are connected to some nozzles in the glove box to spray water and clean the acrylic boards. Another water pump is connected to the bottom of the glove box so that it sucks out all the polluted water.

I will add a filter to the other side of the air pump to prevent dust and other things from getting in and PFAS to get out.

FUNCTION DESIGN



Auto cleaning device can clean the glove box with water and automatically pump all the polluted water out of the box.

Auto ventilation device can pump the polluted air out of the box and filter can let enough air go in and this avoid leaking.

UV light can kill bacteria to keep the glove box clean.

LED Light Strip can light up the glove box to let the operators do experiments easier.

The transition chamber can keep the polluted things in and things from outside out, the things outside would not affect the things in it.

The difference between my glove box and the other one on the internet is that mine can automatically clean the box to avoid pollution and this is designed for our PFAS experiment, PFOA can be dissolved in water so water can bring all PFOA away. I will connect the tube to a bottle to collect the polluted water.

Functions explain



Activated carbon can effectively filter the PFOA out of water.



The air pump can create a negative pressure environment to prevent leaking.



The water pump can pump in water to clean the glove box. PFOA is soluble in water, so water can take PFOA away.



Rubber biology experiment glove will not be eroded by PFOA and users can easily operate with it.

Function explain



Filter the dust and other things in the air so that they would not effect the experiments.



Flanges bundle the gloves to the glove box.



LED UV light strip can kill the bacteria or virus in the glove box after experiment and prepare for the next experiment.

Installation steps

1. Stick the UV light strip and LED light strip to the acrylic boards.
2. Put the acrylic boards together to form the box.
3. Attach the gas tubes and liquid tubes to the holes on the box.
4. Connect the gas tubes and liquid tubes with gas pump and liquid pump.
5. Stick the fixers to the box and use flanges to bundle the gloves on them.
6. Put the filter material into the filter box and stick it on the hole of the box.
7. Finish.

Future

Degradation of PFOA cycle using blue algae

I will need to design a hardware that blue algae can live in it and degrade PFOA. Because of some safety rules, lab-made things cannot go into the nature, as a result, the hardware need to provide the blue algae with environment to live in and collect the crystals produced by the degradation of PFOA, so it would not affect the environment outside the hardware but still achieves its goals. The degradation will happen inside the hardware. The hardware will prevent leaking of blue algae and makes water flow inside.