

## Easy and Inexpensive Conversion of Lab Safety Goggles to Face Shields

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### Introduction

In the time of COVID-19, a need for additional PPE in the form of face shields was deemed necessary for safe laboratory work when in the presence of other students and faculty. An inexpensive method was devised to convert standard laboratory safety goggles into a face shield through the use of commercially available plastic report or presentation covers (sometimes called binding covers). This report describes the fabrication process along with chemical compatibility and flammability testing of the purchased plastic sheets.

### Experimental

*Materials:* Two sets of plastic presentation covers were purchased from Amazon. The first product (Sheet A) ([https://www.amazon.com/gp/product/B07KZKQBZ5/ref=ppx\\_yo\\_dt\\_b\\_asin\\_title\\_o01\\_s00?ie=UTF8&psc=1](https://www.amazon.com/gp/product/B07KZKQBZ5/ref=ppx_yo_dt_b_asin_title_o01_s00?ie=UTF8&psc=1)) was 10 mil in thickness. The second product (Sheet B) ([https://www.amazon.com/gp/product/B077H2RGCL/ref=ppx\\_yo\\_dt\\_b\\_asin\\_title\\_o01\\_s00?ie=UTF8&psc=1](https://www.amazon.com/gp/product/B077H2RGCL/ref=ppx_yo_dt_b_asin_title_o01_s00?ie=UTF8&psc=1)) was 7 mil in thickness. Methanol, ethanol (100%), isopropanol, acetone, ethyl acetate, and dichloromethane were obtained from the departmental stockroom and used without further purification.

*Solvent testing:* For each solvent, ~0.5 mL of the solvent was added to the indicated area. After 30 s, the solvent was removed via blotting with paper towel, and the dried area was inspected for discoloration, deformation, and scarring.

*Flame test:* Exposure to a Bunsen burner flame was tested on the bottom of each sheet in three different manners. On the bottom left, the sheet was held just outside of the flame cone for ~5 s. On the bottom middle, the sheet was dipped into the flame directly and immediately removed. On the bottom right, the sheet was held directly in the flame for ~5 s.

*Face Shield Assembly:* Slits of about 0.5 in in length were cut approximately 9 inches apart on the long edge of the plastic sheet.

The original slit positions were determined by holding the plastic sheet against the lab safety goggles in landscape orientation and marking the position of the straps with a sharpie. The exact location may vary based on the type and style of safety goggles used. Goggle straps were then threaded through the slit in the plastic sheet to attach the sheet to the goggles, creating a face shield.

### Results and Discussion

*Chemical Compatibility.* As observed in Figure 1, Sheets A and B displayed nearly identical results regarding the solvent testing. Alcohol solvents (methanol, ethanol, and isopropanol) showed no discoloration, scarring, or structural damage and appear viable to use for cleaning. Acetone and ethyl acetate showed minor scarring but no discoloration. Dichloromethane effected scarring and discoloration.

*Flammability.* Neither sheet is noticeably flammable but will burn when placed directly in the flame. Sheet B burned noticeably faster and to a greater extent compared to Sheet A. It should

be noted that Sheet A is significantly heavier/thicker than Sheet B. No warping or burning was observed when holding either sheet next to the flame cone.

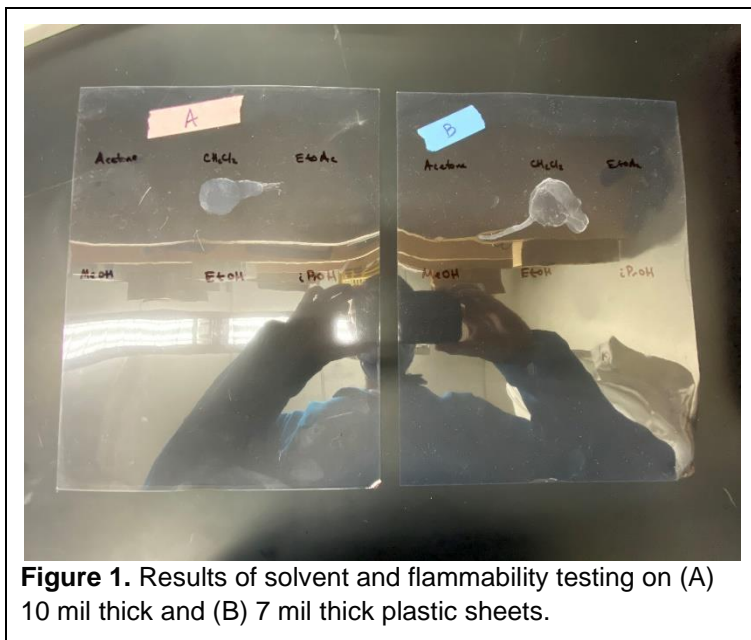
Both sheets appear effective for protecting against organic solvents, including acetone. Alcohol solvents do not affect the structure or transparency. Sheet B burns quicker than Sheet A, and for this reason, we recommend the use of the thicker Sheet A for use in face shield creation.

*Device Fabrication.* Assembly of the face shield is quick and easy. Two slits are cut along the long edge of the plastic sheet in accordance

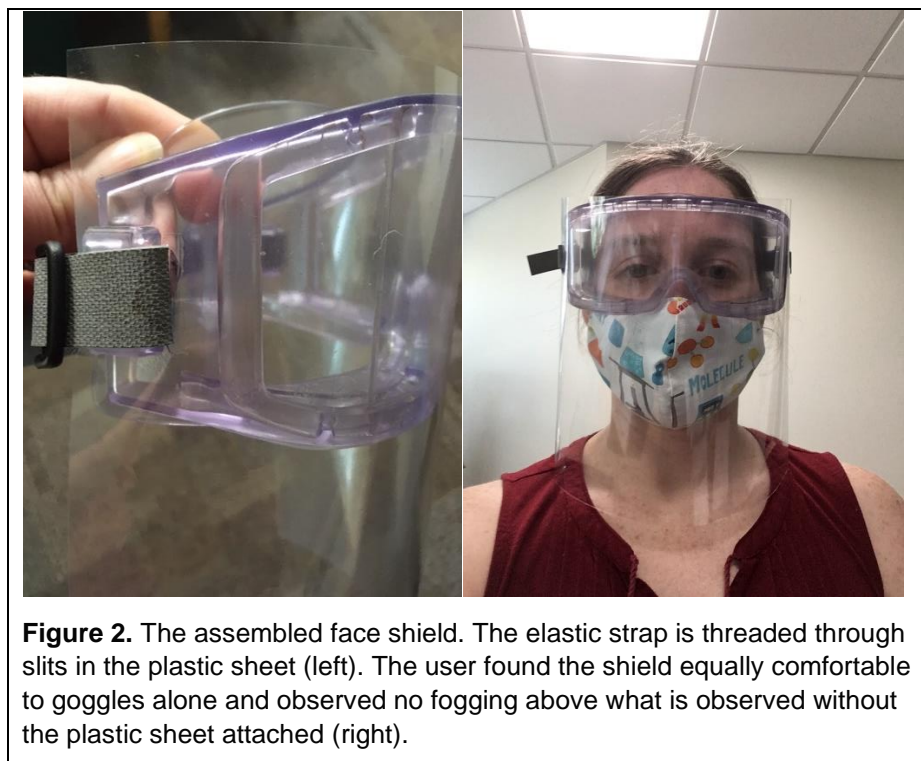
with where the elastic straps attach to the laboratory safety goggles. The elastic straps are then unthreaded from the goggles and re-threaded through the slit in the plastic sheet to hold it in place (Figure 2, left).

Keeping the elastic tight near the face shield helps to hold the plastic sheet in place. The assembled face shield from the laboratory safety goggles is of similar comfort level to the

goggles alone (based on the opinion of the authors, Figure 2, right) and when worn with a fabric face mask does not lead to noticeable fogging of the shield or goggles above that without the plastic sheet attached. The bottom corners of the plastic sheet could be trimmed or rounded for additional comfort.



**Figure 1.** Results of solvent and flammability testing on (A) 10 mil thick and (B) 7 mil thick plastic sheets.



**Figure 2.** The assembled face shield. The elastic strap is threaded through slits in the plastic sheet (left). The user found the shield equally comfortable to goggles alone and observed no fogging above what is observed without the plastic sheet attached (right).

## **Conclusions**

A face shield can be fabricated using inexpensive plastic report covers and standard laboratory safety goggles. This approach reduces the number of PPE items required to be worn on the face and was found to be of similar comfort to goggles alone. The authors recommend thicker (10 mil) plastic sheets when possible for additional fire safety. Best practice is likely to avoid the use of open flames, and to work in fume hoods when possible.