

# Intel International Science & Engineering Fair 2012 Pittsburgh, USA

## Intel ISEF ABSTRACT & CERTIFICATION

Title: ECO friendly gloves  
 Finalist's name: CHU Man Ting, LI Wing Yan  
 School name: Shun Tak Fraternal Association Yung Yau College

### Category

Pick one only—mark and "X" in box at right

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Start Typing the Body of your Abstract Here Beginning at the Left Margin

In recent years, the excessive load of the garbage landfills is imposing increasing pollution problems to our society. We have found that clinics, laboratories and the restaurants disposed a lot of plastic gloves almost every day. These gloves are made of plastics and will accumulate in landfills for hundreds years. Therefore, we purposed that using degradable polymer instead of the commercially available plastic can reduce the load on landfill. Polyurethane is an ideal candidate since it can be eventually degraded into carbon dioxide and water, is easily fabricated into membranes.

Phase-inversion technique has been chosen to fabricate membranes in this project. The conditions of fabricating membranes were also systematically tuned to produce polyurethane membranes with various mechanical properties. The conditions for producing membranes with the optimal mechanical properties were using DMF as solvent, adding non-solvent acetone to push the solution close to inversion boundary, and finally pouring 90°C water to induce phase-inversion. Subsequently, membrane were made into 'glove mimic' and the pull-out strength, ability for waterproof and corrosion resistance, and also the degradation rate of these samples in water were characterized.

The result showed that the pull-out strength of glove mimic (polyurethane membrane after gluing) was similar to that of gloves ( $\sim 2.5 \pm 1.67N$ ). PU membranes were waterproof when contacting with neutral solution, weak alkali and weak acid (pH 2 to 9) in around 10 minutes and would not be corroded or deform. Therefore, polyurethane membranes showed great potential to be used as material in making plastic gloves in terms of these physical properties.

Most importantly, polyurethane was degradable, would decrease in mass with time. The material can also degrade in water (by  $22.38 \pm 1.03\%$  in mass) after 60 days as showed in the immersion test. Therefore, polyurethane being an ECO friendly material which can finally degrade into carbon dioxide and water as shown in the literatures, and having such degradable properties, are excellent candidate to replace the existing non-degradable material in making one-off disposable plastic gloves in order to ease the pressure on landfills and thus reduce environmental pollution.

1. As a part of this research project, the student directly handled, manipulated, or interacted with (tick all that apply):

- human subjects                       potentially hazardous biological agents  
 vertebrate animals                       microorganisms                       tissue

2. Student independently performed all procedures as outlined in this abstract.                       yes                       no

3. A Regulated Research Institution (e.g. university) was a work site for some or all of this project.                       yes                       no

4. This project is a continuation.                       yes                       no

*I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work.*

Mandy  
 Finalist or Team Leader Signature

27-10-2011  
 Date