

Hong Kong Student Science Project Competition 2023
Extended Abstract (Invention)

Team Number: SAPE262

Project Title: A Transparent and Biodegradable Mask Filter

Project Type: Investigation

I. Background

The large number of construction workers are often exposed to volatile organic compounds (VOCs), especially formaldehyde, which is very likely to be carcinogenic. Hence, a large amount of particulate matter (PM) would also be given out during construction. Exposing to PM_{2.5} (particles sized ≤ 2.5 micrometers) will damage human respiratory system including inflammatory injuries. This makes effective personal protective equipment necessary. But in real-life conditions, construction workers may not wear their personal protective equipment(PPE) properly due to the discomfort while wearing it and some of them believed that wearing some PPE would lower working efficiency. The main circumstance that may lead to exposure to formaldehyde for construction workers would be related to the release of formaldehyde from resins, wood products, and paints which are presented as a residue [4].

Aim and Objectives

Through this study, we aim to make a comfortable but efficient filter for construction workers.

II. Objectives

- To compare the filtration efficiency of our SCOPY (with and without activated carbon) with a commercial methanal filter
- To compare its water permeability with a surgical mask filter.

III. Hypothesis

SCOBY is a nanocellulose (biopolymer) and bio-degradable. We hypothesises it can be used as methanal filter.

IV. Methodology

- **Making SCOBY filter**

Materials: Green Tea, Sugar and Kombucha

- **Formaldehyde Absorbability Test**

- **Water Vapour Permeability Test**

V. Results

- **Making SCOBY filter**

We successfully made SCOBY filter using green tea/sugar/Kombucha solution.

- **Formaldehyde Absorbability Test**

Our results show that our SCOBY filter has comparable formaldehyde permeability as a commercial one. It might be due to lots of hydroxyl group in the extensive cellulose fiber network of SCOBY which helps attract the polar formaldehyde.

- **Water vapor permeability**

Our SCOBY filter has a very similar performance on water vapor permeability with commercial mask filters.

VI. Conclusion

Various tests done on SCOBY have shown its potential in the application of filtering air pollutants and working as a mask filter to prevent inhaling formaldehyde in addition to respiratory aerosols or droplets.

Our project is developed based on previous project and the enhancement is below:

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