Clear Futuristic Innovative Technology (ClearF.I.T): A Multi-Tiered Approach to Climate Resilience Power of Partnerships

Tasha Dawson (dawsont@battelle.org) (Battelle, Lexington, KY)
Isabel Escobar (Isabel.escobar@uky.edu) and Ebuka A. Ogbuoji (Ebuka.ogbuoji@uky.edu)
(University of Kentucky, Lexington, KY)

Background/Objectives: According to the World Health Organization, in the U.S over 1.54M people have lost their lives to SARS_CoV-2, and globally the total is over 6.5 million. While there are many mask limitations including comfort, design, availability, fogging, and user hesitancy, masks are the most immediate short-term solution to reduce the transmission of infectious disease.

Moreover, billions of people still breathe unhealthy air. WHO estimates that almost the entire global population (99%) breathes air that exceeds WHO air quality limits and threatens their health. People in low and middle-income countries suffer the highest exposures.

The objective of ClearF.I.T is to be a strategic multi-tiered approach to offer an immediate short-term innovation to reduce the transmission of infectious disease, combat the effects of air pollution on individual health, and to provide an alternative economic recovery system. It is a unique collaborative system utilizing a clear face mask made of recycled materials, polymeric high efficiency membrane, marketing component, and recycling economic recovery plan.

Approach/Activities. ClearF.I.T is a collaboration between Battelle Memorial Institute-Bluegrass Chemical Agent Destruction Pilot Plant and the University of Kentucky, Dept. of Chemical & Materials Engineering. Oversight of the project is by Battelle IRAD dept., Tasha Dawson, MPH and Dr. Isabel Escobar. This collaborative effort has fostered increased knowledge base, greater product exposure across multi-platforms, and higher product engagement/branding.

Membranes in Masks-The importance of high efficiency particulate air filters (HEPA) for HVAC systems and face masks have been emphasized in recent times due to the SARS-CoV-2 pandemic for effective protection against aerosolized microbes. The use of these high filtration efficiency (FE) filters has reportedly resulted in a drastic decrease in infection rate of the easily transmissible virus (SARS-CoV-2).

Polymeric membranes have received increased attention in the past decade for high FE applications using mechanical filtration because the tortuosity and asymmetry of membrane pores can help increase FE at low-pressure drops. In addition, controllable thickness, pore size, porosity and tunable surface functionalization make polymeric membranes very attractive for air filtration.

Results/Lessons Learned. Preliminary membrane testing has shown higher filtration efficiency in N-95 masks, HVAC filtration filters, and surgical masks. Focus group study results show overall high satisfaction with mask. Additional testing will be conducted to apply silver nanoparticles (anti-viral property) to the membranes. Additional mask testing will be conducted to determine, fit, air flow, and decontamination standards. Finally, medial marketing materials and social media formats will be finalized. A ClearFIT mobile app will also be designed to allow the additional usage information, recycle centers, and social interactions.