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Portable, Low-Cost, Sterilization & Disinfection Systems

Until there is an effective vaccine or therapeutic, the current pandemic shows no signs of slowing, placing even more stress on health care systems that are already overwhelmed. The current high demand for personal protective equipment (PPE), particularly N95 masks, has resulted in global shortages. However, because of the specialized machines necessary to manufacture the melt-blown fabric in N95s, ramping up supply takes time. Thus, health care workers and others on the front line have been forced to sterilize and reuse PPE as much as possible. Unfortunately, sterilization systems are expensive and built for large-scale settings, leaving smaller hospitals, clinics and other businesses without adequate means to sterilize their N95s and other PPE.

Because of this pressing need, researchers in the Luminosity Lab at Arizona State University have developed two low-cost sterilization and disinfection systems. The first is a modular ozone generator which generates ozone from atmospheric air. The second is a modular vaporized hydrogen peroxide sterilization system. These sterilization systems can be used in industrial, educational, medical, military, consumer or other settings to disinfect and sterilize any number of items including medical supplies/equipment, PPE, clothing, school supplies and more. N95 masks sterilized in the VHP system were shown to perform at the same level as new, untreated masks. The ozone system has demonstrated sterilization of viral particles and could be effective for surgical masks, cloth face covers, other PPE, etc.

Both devices were inspired by commercial-grade sterilization methods, but unlike their industrial counterparts, these systems are affordable, made from readily available materials, and scalable for small businesses.

Potential Applications

- Systems for sterilization and disinfection in diverse settings including but not limited to: healthcare, industrial, educational, consumer, military, high traffic public areas such as airports and more
 - o PPE: N95 masks, shields, face covers, surgical masks, clothing
 - o Medical equipment/supplies

- o Markers, pens, pencils and other shared school supplies (testing on electronics i.e. laptops, headphones, etc., ongoing)
- o Airport bins, wands, swab handles, etc.

Benefits and Advantages

- The ozone sterilization system:
 - o Treated PPE inoculated with P-22 bacteriophages showed a 6-log₁₀ reduction in viral load
 - o Easy & low-cost to manufacture (\$65 per unit)
 - o Environmentally sustainable & modular
 - o Consistent ozone gas generation
 - o Simple enough to be run from any power source
 - o Throughput: for cloth face coverings or similar items - 30/150 minutes
- The vaporized hydrogen peroxide sterilization system:
 - o Treated PPE inoculated with P-22 bacteriophages showed a greater than 6-log₁₀ reduction in viral load
 - o Easy to manufacture; no specialized tools required
 - o Compact and easily deployable/portable format
 - o Gentle on PPE for potentially more reusability
 - o Relatively inexpensive (~\$300 per unit to manufacture)
 - o Throughput: for N95s - 12/hour, for surgical masks – 30/hour

For more information about this opportunity, please see

[ASU NOW - 2020](#)

[Dave et al - medRxiv - 2020](#)

[Dave et al - medRxiv - 2020](#)

For more information about the inventor(s) and their research, please see

[The Luminosity Laboratory webpage](#)