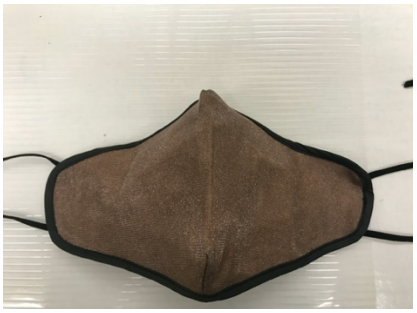
Technical Aspects of the Reed Multilayer Mask. 12-3-2020. Shirley and Ken Reed

The mask that you have received is composed of three individual silver anti-microbial cloth layers and one pure copper mesh layer. The 75 micron copper layer is both an anti-microbial and an anti-viral layer. No representation is being made as to the mask's integrated pathogen killing properties. Below is the rational for the design and are some data on the individual layer performance (which should behave additively and not antagonistically).



The reason for the four layers is that together they provide a higher level of protection from aerosol-borne pathogens than an N95 mask (95% pathogen blockage or a transmission of 5% i.e. 50,000 ppm). In addition, multiple layers provide redundant protection in the event of a layer tear. With a conservative estimated aerosol particle transmission coefficient of 20 % per layer, the total aerosol transmission fraction of four layers is now just 1600 ppm. As the "size" of a nitrogen or oxygen or water molecule is on the order of less than one nanometer, the multiple layers do not uncomfortably restrict breathing.

The outermost layer is a transparent tuille weave through which the underlying copper mesh is visible.

The second layer is a 75 micron pure copper metal mesh. Initial studies using a concentrated liquid virus droplet placed directly on the mesh indicates that at room temperature, 99% of the virus population is killed within one hour. This is a severe test as in normal practice , the aerosol borne virus will be transported in a 2 to 5 micron particle and not a one millimeter droplet. In addition, the copper layer is thermally activated by the wearers breath (by about 6 degrees C or so) and viral death rates are greatly accelerated as the temperature is raised.

As an historical aside, the antiseptic properties of copper have been known for over 5000 years The Egyptian symbol Ankh

is the symbol of life and closely resembles the symbol for female.

In mythology and alchemy, Aphrodite and Venus are represented by this same symbol for copper . The Phoenicians, 2750 years ago inserted into flesh wounds, slivers of their bronze swords (copper plus tin) to prevent the wound from being infected. With the passage of a great amount of time, we moderns did learn that copper metal binds (ligates) the purine and pyrimide nucleo base pairs of the virus single stranded RNA and prevents it from replicating or, in the form , Cu^{+1} or Cu^{+2} oxidizes other molecules that are necessary for virus replication (note these mechanisms are not virus specific- they apply to this class in general).

The third layer is a three component BMT VirusGuard NanoScreen™ PPE Filtration Fabric Type 9004 Advanced Grade from Metroscreenworks. An independent laboratory has provided the following public data:
VFE or Viral Filtration Efficiency average = 99.9% (3 micron test particle size)
BFE or Bacterial Filtration Efficiency average = 99.9% (3 micron test particle size)
PFE or Particle Filtration Efficiency average = 97.8% (0.1 micron test particle size)

The fourth layer which lies closest to the wearers face is a soft cotton jersey treated with silver antimicrobial material.

This mask has an extended nose cavity that facilitates breathing and upon inhalation, is drawn somewhat into the wearers nostrils to form a better seal with the wearer's face.

The mask is intended to be used multiple times (it's a good idea to put your name on the mask) and can be cleaned by several methods:

1. Rubbing alcohol (isopropyl alcohol) application to the exposed surfaces by a cloth or IPA wipe.
2. UV irradiation
3. Gentle hand soap and water wash.

A bonus feature is that the mask can be dabbed with a very slight amount of essential oils or perfume at night so that the next day, the mask has a pleasant bespoke aroma.

Keep breathing,

Ph.D.