

From Wendy Todd of [Covid-19 Open Source Medical Supplies Group](#):

MASK MATERIALS MATTER

If you plan to make DIY facemasks for the COVID-19 crisis, good on you!

It appears that many sites have mask design covered. Make your work count by carefully choosing the materials you use. Don't use fabric softener or dryer sheets when you launder your final product (see below).

Fair warning: I am a textile scientist with primary expertise in military protective clothing and equipment. I've been reading the DIY facemask posts, and I keep wishing someone from the medical textile field would weigh in. Until someone like that does, I offer the following info under "Good Samaritan" rules. I desire and invite immediate corrections!

WHAT ARE SURGICAL MASKS MADE OF - WHAT DO DIYers NEED TO FIND?

It appears that the 3-layers of a typical, disposable surgical mask are made of "melt-blown" fabrics. "Melt-blown" fabrics are not the woven or knitted structures in, say, t-shirts and jeans; they are more like paper maiche. Instead of strips of paper stuck together with whey to form a sheet, very thin plastic filaments are stuck *to each other* (thanks Pete Kant!) to form a sheet. The complex layering and overlapping of these thin plastic filaments creates a thicket-like maze that can trap particles. Handy visualizations of melt-blown fabrics are cotton candy and the very cheapest HVAC air filters.

The thin plastic filaments in typical disposable facemasks are a polymer called polypropylene. Polypropylene has two great properties for repelling viruses: it is negatively charged, and it is water-repellent. Now, viruses need water to remain viable, and are also negatively charged. As you recall from 5th grade science class, negative repels negative. Thus, the negatively-charged polypropylene molecule will repel the negatively-charged virus, and because polypropylene also repels water, the virus is denied the moisture it needs to be viable. Ta-da! Yay for polypropylene!

It appears that there may be three separate types of polypropylene fabrics in the facemask: a breathable type for next to mouth, a microfiber filtering type in the middle, and a barrier type on the side facing the world.

The issue for DIYers is that you can't just go down to your neighborhood fabric store and ask for 10-yards of these three types of melt-blown polypropylene fabric. The closest melt-blown fabric in fabric stores is a product called "interfacing" (e.g., Pellon) which is made of polyester. Fortunately, polyester also repels water, and is also negatively charged - just not as negative as polypropylene. Only the non-fusible kind (i.e., without glue on the back) might do as a substitute. I guess you could make masks using polyester interfacing with a smooth texture as the fabric. But what a lot of work for something that would have to be thrown away after one wearing! And interfacing with a smooth texture is pretty pricey.

CHOOSING A DESIGN

There are many posts on this site that competently re-create the disposable pleated mask design; I believe that a 3-layer, re-useable design (a pleated cloth pocket into which a disposable filter inserted) offers the best balance of DIY effort and practical medical protection. See www.mustsharenews.com "Taiwanese Doctor Recommends DIY Cloth Face Mask with Air Filter" for a good description. I recommend specific materials for a re-useable mask below based on what I have learned (above) about what is used in typical disposable 3-layer surgical/medical masks. For all our sakes, I would love any corrections from a true expert.

Outermost layer: microfiber, soft, woven polyester shower curtain liner (not vinyl or PEVA sheeting); try to find dimpled surface texture

Example:

https://www.amazon.com/dp/B07BMQ8RVL/ref=psdc_13749851_t3_B077PQCLHD

"Barossa Design Soft Light-Weight Microfiber Fabric Shower Liner or Curtain with Embossed Dots, Hotel Quality, Machine Washable, Water Repellent, White, 70 x 72 inches" \$10.99

Why: Negatively-charged and water-repellent

Disposable filtration layer: Swiffer-type heavy-duty sweeper refills, unscented

Example: https://www.amazon.com/Swiffer-Sweeper-Refills-Cleaning-Unscented/dp/B07622VSV3/ref=sr_1_5?dchild=1&keywords=Swiffer+refills&qid=1584857774&s=home-garden&sr=1-5

Why: Easy for medical personnel to find and cut up as replacement filter layer; designed as particle trapper, and just might be made of polypropylene

Next to nose/mouth layer: Ummm.... I'm on the fence here. Either cotton flannel, OR another layer of the polyester shower curtain lining

Why cotton: Cotton is porous, which makes it more comfortable for breathing. Also, because cotton is positively charged, the negatively charged virus exiting the wearer's mouth or nose will be attracted to the cotton molecule and not migrate through the mask to the outside where it can infect others. Also, because cotton is absorbent, it will pull the moisture out of the virus, causing it to "die" faster. Note, however, that when cotton gets wet

and stays wet, it becomes more abrasive to the skin. This may mean someone with a sweaty face will have to change a cotton-lined mask more often to stay comfortable.

Why flannel: Studies shows that pile fabric structures (e.g., terry cloth) are more effective at trapping virus. Flannel, while not as thick a pile as terry cloth, may be more practical for facemasks by decreasing bulk and heat-buildup.

Why polyester liner: Reduce manufacturing time (the re-useable pocket can be one folded structure) and reduce trouble in finding and keeping different materials on hand; also, might be comfortable more for long-term wear for someone with a sweaty face by avoiding the wet abrasion of cotton.

Why dimpled: While not a pile, the stand-off of dimpling increases the distance a virus has to travel to escape the mask and also provides more surface area to trap virus particles; also the stand-off of dimpling increases next-to-skin comfort and breathability by not contiguously touching the skin.

Last suggestions:

Consider making the outer layer a different color than the inner layer so the wearer doesn't have to think about which side goes toward the face.

Stay healthy, everyone