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What Are The Best Materials for Making DIY Masks?

2020-03-08 (https://smartairfilters.com/en/blog/best-materials-make-diy-face-mask-virus/) Paddy Robertson (https://smartairfilters.com/en/blog/author/paddy/) Coronavirus (https://smartairfilters.com/en/blog/category/coronavirus/), Masks (https://smartairfilters.com/en/blog/category/masks/)

With masks sold out during the coronavirus outbreak, many people will have to make do with what some scientists have called “the last resort”: the DIY mask.

Data shows that DIY and homemade masks are effective at capturing viruses (https://smartairfilters.com/blog/diy-homemade-mask-protect-virus-coronavirus/). But if forced to make our own mask, what material is best suited to make a mask? As the coronavirus spread around China, netizens reported (https://haokan.baidu.com/v?pd=wisenatural&vid=12977803613437112665) making masks with tissue paper, kitchen towels, cotton clothing, and even oranges!

The Best Material for Making a Homemade DIY Mask

Researchers at Cambridge University (https://www.researchgate.net/publication/258525804_Testing_the_Efficacy_of_Homemade_Masks_Would_They_Protect_in_an_Influenza_Pandemic#pf7) tested a wide range of household materials for homemade masks. To measure effectiveness, they shot Bacillus atrophaeus bacteria (0.93-1.25 microns) and Bacteriophage MS virus (0.023 microns in size) at different household materials.

They measured what percentage the materials could capture and compared them to the more common surgical mask.

Not surprisingly, the surgical mask performed best, capturing 97% of the 1-micron bacteria. Yet every single material filtered out at least 50% of particles. The top performers were the vacuum cleaner bag (95%), the dish cloth ("tea towel" in the UK! 83%), the cotton blend shirt (74%), and the 100% cotton shirt (69%).

Homemade Masks vs. Viruses

That test used bacteria that were 1 micron large, yet the coronavirus is just 0.1 microns – ten times smaller. Can homemade masks capture smaller virus particles? To answer this question, the scientists tested 0.02 micron Bacteriophage MS2

particles (5 times smaller than the coronavirus).

On average, the homemade masks captured 7% fewer virus particles than the larger bacteria particles. However, all of the homemade materials managed to capture 50% of virus particles or more (with the exception of the scarf at 49%).

Coronavirus & Mask Livestream

Wondering whether masks work to protect you against the coronavirus? Check out our livestream recap covering all the info here (https://www.facebook.com/smartairfilters/videos/1097078063991680/)!

Are Two-Layered DIY Masks More Effective?

If the problem is filtration effectiveness, would the masks work better if we made two layers? The scientists tested virus-size particles against double-layered versions of the dish towel, pillow case, and 100% cotton shirt.

Overall, the double layers didn't help much. The double-layer pillowcase captured 1% more particles, and the double-layer shirt captured just 2% more particles. Yet the extra dish cloth layer boosted performance by 14%. That boost made the tea towel as effective as the surgical mask.

Looking at the data, the dish towel and vacuum cleaner bag were the top-performing materials. However, the researchers didn't choose these as the best materials for DIY masks:

Instead, they concluded the pillowcase and the 100% cotton t-shirt are the best materials for DIY masks. Why?

The Importance of DIY Mask Breathability

The answer lies in breathability. How easy it is to breathe through your mask is an important factor that will affect how comfortable it is. And comfort isn't merely a luxury. Comfort will influence how long you can wear your mask.

Fortunately, in addition to particle effectiveness, the researchers tested the pressure drop across each type of fabric. This gives us a good indication of how easy it is to breathe through each material. As a benchmark, they compared breathability of each DIY mask material to the surgical mask.

Although the tea towel and the vacuum bag captured the most particles, they were also the hardest to breath through. With two layers, the tea towel was over twice as hard to breathe through as the surgical mask. In contrast, the pillow case, t-shirt, scarf, and linen were all easier to breathe through than the surgical mask.

Researchers' Pick for Best-Performing Homemade Mask Material

Based on particle capture and breathability, the researchers concluded that cotton t-shirts and pillow cases are the best choices for DIY masks.

Are there any other materials we can use? The Cambridge researchers left out one common material: paper towel. We tested how well paper towel masks capture sub-micron particles (https://smartairfilters.com/blog/paper-towel-effective-against-viruses-diy-mask/).

Making DIY Masks with Household Materials

Bottom line: Test data shows that the best choices for DIY masks are cotton t-shirts, pillowcases, or other cotton materials.

These materials filter out approximately 50% of 0.2 micron particles, similar in size to the coronavirus. They are also as easy to breathe through as surgical masks, which makes them more comfortable enough to wear for several hours.

Doubling the layers of material for your DIY mask gives a very small increase in filtration effectiveness, but makes the mask much more difficult to breathe through.

Here's What Else You Should Know About DIY Masks

Still not sure if DIY masks really work? See the real-world test data on the effectiveness of homemade DIY masks (https://smartairfilters.com/blog/diy-homemade-mask-protect-virus-coronavirus/).

Already convinced that DIY masks work? Then learn how to make a DIY mask here [coming soon!]

(/redirect/?r=https://www.facebook.com/smartairfilters/videos/1097078063991680/)

Paddy Robertson (https://smartairfilters.com/en/blog/author/paddy/)

Paddy is the CEO of Smart Air, running operations from Beijing. He's has a Masters in aeronautical engineering from Bristol University, UK having specialised in aerodynamics. An advocate for open data, free information and transparent business, he spends his spare time promoting honest business and social enterprise.

Here’s what else you should know about:

N95 Masks vs. Surgical Masks: Which Is Better at Preventing The Coronavirus? (https://smartairfilters.com/en/blog/n95-mask-surgical-prevent-transmission-coronavirus/?rel=1)

DIY Masks: Is Paper Towel Effective at Blocking Viruses? (https://smartairfilters.com/en/blog/paper-towel-effective-against-viruses-diy-mask/?rel=1)

Can DIY Masks Protect Us from Coronavirus? (https://smartairfilters.com/en/blog/diy-homemade-mask-protect-virus-coronavirus/?rel=1)

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Michelle

Please test puppy training pads (torn off the waterproof backing, of course!) and coffee filters as filter material.

Also – please add the “how to make one” info (currently showing as [coming soon!] ASAP! The frontlines need these quick.

Thanks!!

2020-03-21 4:07 pm

Betty Davis

what about using a 100% cotton baby diaper? Do you think that would work for a DIY Mask?

2020-03-21 12:22 pm

ILM

Would adding a layer of lightweight/featherweight non-woven fusible interfacing between the two layers improve filtration without compromising breath ability ?

2020-03-21 12:13 pm

Marty

Even if cotton shirts are a good alternative material, there are various types and weights of cotton material. They can’t all perform the same.

2020-03-21 12:04 pm

janet

i asked a question that was designed by your site, smartairfilters.com to be answered. i do not want an answer from the public who hasn't tested the material as you have. please clarify the information which you have provided. here it is again. the image is of a pillow but you say pillow case, your studies say pillow case. is it the pillow case that is purchased separately? or is it the casing around a pillow in which case i would cut open a pillow and take the stuffing out and use that material. you have to answer the question... Read more »

2020-03-20 10:05 pm

Lisa

It does state that it's an anti microbial pillowcase that was tested.

2020-03-21 1:26 pm

dave

Janet, this site is referring to a university study that (unfortunately) offers zero specifics about the actual fabric they used beyond what is written here (t-shirt, pillowcase).
In an ideal world the researchers would have noted thread fiber (cotton, silk, polyester, etc) weave (damask, satin, dobby, percale, etc) thread size/count (200, 400, etc). Instead they reported "pillowcase."

Also, the study determined that 100% cotton t-shirt was BETTER at filtering and breathing easily than the pillowcase, so you should just use a t-shirt anyhow!

2020-03-21 2:59 pm

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