Polypropylene, the material now recommended for COVID-19 mask filters: What it is, where to get it

November 20 2020, by Catherine Clase, Charles-Francois De Lannoy, Scott Laengert

New recommendation advise using an additional layer of polypropylene fabric in cloth masks to act as a filter. Credit: Sara Alas/Niko Apparel

Adding a third layer to cloth face masks is now recommended for preventing the spread of COVID-19. Non-woven polypropylene fabric is the material of choice for this third layer, but many people may not know what this material is, or where to get it.

With masks being made at home and by local clothing companies, here's what you need to know about Public Health Agency of Canada's new recommendations.

Every study that has examined layering has found that using additional layers in face masks improves filtration, but some fabrics provide more filtration than others. We support the public health recommendation, and specifically recommend the use of industry-grade "spunbond" polypropylene as a middle layer in washable cloth masks.

Spunbond polypropylene destined for the clothing and furniture industries has a fabric-like feel. It is washable and will not divert supply of medical-grade polypropylene from the manufacture of formal personal protective equipment.

Our research group, with expertise in epidemiology, chemistry, textiles and the mask industry, seeks to improve cloth masks for community use.

Types of non-woven polypropylene

Traditional materials for clothing and furniture have a woven or knitted structure. Non-woven materials, by contrast, have a random arrangement of fibers, like spaghetti on a plate. This randomness enables high particle filtration while remaining highly breathable.

A pleated cloth mask with the bottom seam opened and a rectangle of washable industry-grade spunbond polypropylene inserted as a filter. Credit: Sara Alas/Niko Apparel

There are many types of non-woven polypropylene. The most common are spunbond, meltblown and spunlace materials.

In some spunbond polypropylene the randomly oriented fibers are compressed and melted together in a pattern of small, closely spaced welds, called point bonds.

Lightweight medical-grade spunbond polypropylene, found in the outer layers of three-layer certified medical masks, has been tailored for medical uses. But as a single-use material, it is not designed to be

washed.

Washable spunbond polypropylene is used in the clothing and furniture industry. It is one of several materials used as interfacing, to give structure to waistbands and collars, and around zippers. It is also used to seal the bottom of couches and chairs. It is readily available from fabric distributors and is not currently in short supply since it is not part of the supply chain for personal protective equipment. This material likely aligns with public health recommendations.

The regular pattern of tiny point welds can be seen in this sample of washable, industry-grade white spunbond polypropylene. Credit: Mark Diamond/Veratex Lining Ltd

Recommended material

For community mask manufacture, we suggest using industry-grade spunbond polypropylene.

Manufacturers produce single and double layers of spunbond. There are few published data on its filtration properties, but we suggest using a fabric with a rating of 68 grams per square meter, or two layers of a less dense one.

The material can be integrated as a middle layer when masks are being made.

Alternatively, a rectangle of spunbond polypropylene can be inserted between the two outer layers of a cloth mask. The material does not fray easily. If using two layers of polypropylene, we suggest folding the material in half and sewing it together with a simple stitch or an overlock, to make a washable filter.

The polypropylene can be cleaned as recommended by Health Canada: a hot wash with detergent. It can be washed with the mask or separately. It should not be tumble dried: it should be removed from the mask and hung or laid flat to dry before reinserting. Do not iron it: it is plastic and will melt.

Our website and previous research summarize what is known about

choosing suitable material for the other layers.

Fabric distributors have these materials in bulk and are working to get them to retail. Mask makers can expect to see them in stores by late November.

Unsuitable materials

It is important to recognize that not all interfacing is polypropylene. Many brands are polyester or polyester-rayon blends. This is a completely different material. In the retail market, interfacing is sometimes sold as a fusible product. This means that it is pre-glued to help with accurate placement before it is stitched into place. These pre-glued fabrics should not be used for face coverings because the glue may affect filtration and breathability.

Some reusable shopping bags made from spunbond have a shiny plastic coating. These are not breathable and should not be used.

A three-layer pleated mask using cotton outer layers and a fully-integrated middle layer of 68 gsm (two ounces per square yard) polypropylene. The mask is quite structured but comfortable, because of the cotton, and completely washable. Credit: Catherine Clase

Meltblown polypropylene is used as the middle layer of many certified

medical masks and in the manufacture of respirators such as N95s: it filters very well. It remains in short supply, with many distributors in Canada fully committed to July 2021. It is not intended to be washed, though novel programs for limited reuse of respirators have been developed for hospitals.

Because of the supply issue and because it is not washable, we do not recommend using meltblown polypropylene for reusable non-medical masks.

Disposable non-medical filters intended to be inserted into pocket masks are sold commercially and may contain meltblown, spunbond and other components; it is not always possible to determine their composition from the packaging or advertisements. Currently no standards define their use in Canada. They are designed to be discarded after each use.

Spunlace polypropylene tends to be naturally springy and in contrast to spunbond and meltblown, it absorbs liquids. Some wet wipes are produced by spunlace methods. However, the material used is often not polypropylene but rather viscose-polyester blend, to increase absorbency. The composition of the wet ingredients is clearly specified on packaging, but many wipes do not include the fiber composition of the material. These materials are not intended to be laundered and reused. Some wipes contain active ingredients that might be harmful if inhaled. For all these reasons, we do not recommend using dried-out wipes as filters.

Non-woven polypropylene made with a needle-punch method is a continuous material that is completely perforated by thousands of fine needles on a roller. These holes offer a low-resistance path for airflow without fibers projecting into the gap. We predict they would filter poorly and do not recommend them.

Two layers of black industry-grade spunbond sewn to make a washable filter. Credit: Mark Diamond/Veratex Lining Ltd.

Some shopping bags made from spunbond polypropylene have a shiny plastic surface: they are not breathable and should not be used. Credit: Jonathan Clase

Imperfect does not mean unhelpful

Imperfect use of imperfect masks has the potential to help control the spread of COVID-19. Important decreases in transmission have been

observed following mask mandates, using the masks currently available. Industry is working to respond to the new guidelines by increasing the availability of polypropylene fabrics.

At the Center of Expertise in Protective Equipment and Materials, engineering faculty and graduate students are working to identify the best materials to use for cloth masks. We hope to be able to describe textiles that are likely to filter well and be breathable using standard industry descriptors such as the type of material and the weight.

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