

PERFORMANCE OF PRE-CONSUMER WASTE COTTON MEMBRANE FOR FILTERING AEROSOLIZED PATHOGENS

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Filter membranes and facemasks are among the most efficient methods to prevent respiratory pathogen transmission, even better than hand washing in terms of direct protection. For example, many people wore low-cost cotton masks during the COVID-19 pandemic with little efficacy. This study describes a simple method to develop porous membranes from waste cotton fabric using vacuum filtration. Natural cotton fibers were partially dissolved at various temperatures to maximize porosity, and the membrane collected at 80 °C (0.13 g fibers) provided the best pore uniformity. Scanning electron and tensile testing provided an average porosity of 57.87–62.60% and average pore area of $0.69 \pm 0.46 \mu\text{m}$, which were somewhat smaller than the $7 \pm 0.2 \mu\text{m}$ pores of surgical masks. The membranes showed 72.4% sodium particle filtration efficiency and 99.8% bacterial filtration efficiency, which degraded to 82.4% after ten wash cycles consistent with BSEN14683:2019. Overall the data suggest waste cotton-derived filter membranes can be effective, eco-friendly pathogen filtration methods, in further research.

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