

Facemask comfort enhancement with graphene oxide from Recovered carbon waste tyres

ABSTRACT

Commercial disposable facemasks have lower breathability and may cause discomfort after hours of wearing them. Graphene oxide (GO) nanoparticles offer a significant opportunity to improve the breathability of facemask materials. Hence, the current study aimed to investigate the feasibility of incorporating GO in facemask materials. The GO was synthesized from recovered carbon of waste carbon tyre. In this study, two concentrations of GO (0.01 and 0.02%) were used to enhance the comfort properties of the polypropylene (PP) facemask fabric. The GO-coated PP facemask fabrics were characterized for scanning electron microscopy, energy dispersive X-ray, and Raman spectroscopy. The comfort properties were determined using air permeability, water vapour permeability, and moisture management test. Raman analysis revealed distinctive peaks corresponding to GO at approximately 1,300 and 1,500 cm^{-1} . The GO displayed bumping pieces of particles and a textured surface, with a diameter ranging from 30 to 80 nm. The result of mercury porosimetry shows that the PP fabric coated with 0.02% of GO provided a higher pore diameter and porosity at approximately 21.31 μm and 82.79%, respectively. Due to its high pore diameter and porosity, the PP filter facemask fabric coated with 0.02% GO demonstrated enhanced air permeability, water vapour permeability, and moisture management. These results suggested that the sample possesses favourable breathability properties as compared to the sample without GO. By undertaking this study, GO synthesized from the waste carbon tyre was developed, which can enhance the breathability of fabric materials.