Quaternary ammonium functionalised graphene oxide/Polylactic acid (PLA) based porous antibacterial membrane for water treatment

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Abstract

In this study, we synthesized a novel set of green polymer polylactic acid (PLA) based membranes incorporated with cross-linked silylpropyl quaternary ammonium graphene oxide (CSQAGO) nanomaterials. The CSQAGO nanomaterial is inherently functionalized to have increased hydrophilicity and introduce quaternary functional groups, thereby improving antibacterial properties. The base polymer was chosen as PLA due to its good membrane-forming ability and eco-friendly nature. The membranes, synthesized with varying concentrations of CSQAGO (2-6 wt%), are thoroughly characterized to determine their morphological, chemical, and performance-related properties. The best-optimized membrane (with the highest loading of nanomaterials) exhibited a 2.2-times increase in pure water flux in compared to the base membrane. The best membrane showed a significant water treatment with enhanced antifouling properties. Furthermore, the synthesized membrane exhibited more than 71% inhibition towards bacteria compared to the base PLA membrane.