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Biosynthesis of thin film derived from microbial chitosan for piezoelectric application
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Abstract
The aim of this paper was to synthesize and characterize microbial chitosan thin films for potential piezoelectric application. Microbial chitosan was derived from the Aspergillus oryzae fungus via extraction and deacetylation. Chitosan thin film was characterized for its surface morphology, chemical properties, tensile strength, and surface topography. For the potential application of chitosan as a piezoelectric material, its piezoelectric characteristics were presented in terms of its electromechanical coupling coefficient and piezoelectric coefficient. The fabrication of the chitosan thin films was optimized via the one-factor-at-a-time (OFAT) method, where the parameters were type of acid solvent, acid concentration and mixing time. The chitosan film prepared using formic acid at a concentration of 0.25 M for 3 h of mixing time had the highest tensile strength (129.29 MPa), electromechanical coupling factor (0.0045), and piezoelectric coefficient d31 (10 pC/N). The results obtained, from the optimized fabrication of the chitosan thin film, were validated against fungal chitosan, and it was shown that the properties of the thin film were comparable to those of commercial PVDF thin films. Therefore, the prospect of using microbial chitosan thin film as wearable piezoelectric energy harvester or nano-generator is promising. © 2021 Elsevier Ltd

Author Keywords
Aspergillus oryzae; Chitosan; Deacetylation; Fungi; Piezoelectric; Thin film

Index Keywords
Aspergillus, Biochemistry, Film preparation, Mixing, Piezoelectricity, Tensile strength, Thin films, Topography; Aspergillus Oryzae, Deacetylation, Electromechanical coupling coefficients, Mixing time, One-factor, Piezoelectric, Piezoelectric characteristics, Piezoelectric coefficient, Tensile surfaces, Thin-films; Chitosan

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