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Nanocellulose and chitosan based films as low cost, green piezoelectric materials

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Highlights

- Piezoelectric sensitivity of chitosan and nanocellulose based films was measured
- Structure of the films was compared with their piezoelectric and tensile properties
- Chitosan and nanocellulose had higher piezoelectric sensitivities than their blends
- The films are potential candidates for low-cost biodegradable sensor applications
- Blending can be considered for tailoring the mechanical properties of the films

Abstract

Nanocellulose and chitosan have recently started to get attention as environmentally friendly piezoelectric materials for sensor and energy harvesting applications. Conversely, current commercially available flexible piezoelectric films made of for example polyvinylidene difluoride (PVDF) are relatively expensive and made from non-renewable materials. We measured the piezoelectric responses (2-8 pC/N) for solvent casted films based on nanocellulose, microcrystalline chitosan and their blends. In addition, the tensile properties of the piezoelectric films were characterized to find out if chitosan could be used to enhance the flexibility of the brittle nanocellulose films. Based on the results, plain chitosan is an interesting piezoelectric material itself. In addition, blending nanocellulose and chitosan could be a potential method for tailoring the properties of solvent casted low cost, green piezoelectric films.

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