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Highly aligned narrow diameter chitosan electrospun nanofibers

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Random and highly aligned bead-free chitosan nanofibers (NFs) were successfully prepared via electrospinning by keeping the applied voltage (22 kV), flow rate (0.4 mLh^{-1}), needle diameter (0.8 mm) and needle to collector distance (100 mm) constant while varying the solution concentration and collector rotation speed. No electrospinning was observed for lower solution concentrations, i.e., 1-3 wt% (w/v), whereas a decrease in the number and size of beads and microspheres, and bead-free NFs were observed when the concentration of solution was increased from 4 wt% to 6 wt%. Increase in the polymer concentration increased the solution viscosity (from 3.53 mPas to 243 mPas) and conductivity (from 29.80 μScm^{-1} to 192.00 μScm^{-1}) to critical values, which led to beadless NFs. The optimized conditions (i.e., concentration of solution 6 wt%, applied electrical potential 22 kV, flow rate 0.4 mLh^{-1}, needle diameter 0.8 mm, and needle to collector distance 100 mm) were further used for the alignment of chitosan NFs. The alignment of the NFs increased from 3 to 94.4% and the diameter decreased from 163.9 nm to 137.4 nm as the rotation speed of the cylindrical collector drum was increased from 2.09 ms^{-1} to 21.98 ms^{-1}. The aligned and small diameter chitosan NFs might find potential applications in biomedical, environmental, solar fuel cell applications, etc. Several target devices and polymer systems in the literature have been used to obtain aligned NFs; however, almost no work has been reported on individual chitosan alignment.

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Review of eco-environmental properties and test concept suggestion of biodegradable geosynthetics

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For eco-environmental concept in geosynthetics application fields, "Green" revolution is rapidly increasing in every construction sites e.g., green structure, green installation, green industry, etc., especially between construction and society's needs. Furthermore, although durability of geosynthetics should be emphasized for long-term service period, durability controlled mechanism could be required to fulfil the short-term degradability purpose for green geosynthetics. "Green Geosynthetics" can be defined as following: Green geosynthetics are made of eco-environmental biodegradable polymeric resins or natural materials and they must maintain their needed performance such as durability, design strength, hydraulic property, etc., during service period in the application field. Then, after sevice period they should be degraded causing no harmful state in the soil structures. In this study, concept of green geosynthetics was introduced in terms of biodegradability. Development of green geosynthetics, its background and technical concerns were discussed through some research results of PLA (polylactic acid) specimens. Test method for biodegradability of PLA (polylactic acid) as a green geosynthetics were considered and suggested based on composting method. Finally, the rest result shows that the concept of biodegradability for green geosynthetics is available in the environmental application. Through the overall environmental performance analysis of biodegradability as green geosynthetics, it is seen that biodegradable mechanism is possible to control theoretically and to control bio-degradability of PLA used green geosynthetics. However, more restricted design technology must be adopted for this and more specific composition and selection of optimum additives of PLA blending should be determined for the quality control of PLA related geosynthetics. To evaluate the biodegradability of green geosynthetics performance, new test methods should be introduced and the needed evaluation items should be selected by considering influence parameters on the long-term performance under real field installation conditions.

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