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ELECTROSPUN POLYACRYLAMIDE MEMBRANE FOR IMMOBILIZATION OF ACETYLCHOLINESTERASE ENZYME

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In this work, polyacrylamide (PAM) was synthesized in a lab-scale batch reactor via an anionic solution polymerization of acryl-amides to achieve a narrow and high molecular weight distribution. We used this polymer since polyacrylamide gels are known to include suitable properties for enzyme immobilization application. Thereafter, we employ final PAM nanofibers to immobilize Acetylcholinesterase (AChE) after electrospinning. The obtained polyacrylamide was dissolve in water at four different PAM weight fractions and spun through electrospinning method. The morphologies of resulting mats were examined with scanning electron microscopy (SEM). The imaging analysis depict that the beads are completely disappear and very fine fibers with average diameter of 120nm are achieved at 8 wt% PAM concentration. Functionalized multi-wall carbon nanotube (f-MWCNT) with carboxyl groups were then dispersed in solution for 3 hours in an ultrasonic bath. Addition of MWCNT to the system caused the nanofiber diameter reduction as expected. The mechanical and electrical properties of the membrane with different f-MWCNT (0%wt, 1%wt, 3%wt, %5wt) were also studied to make sure of preparing suitable membrane for biosensor application. Then AChE was immobilized on membrane with 3 different methods including: 1) Immobilization on f-MWCNT surface, 2) Co-spinning AChE with PAM/f-MWCNT and 3) Immobilization of AChE with drop coating method on PAM and PAM/f-MWCNT electrospun mats. The stability and enzyme's response was examined in different conditions. The infrared spectrum, the UV-Vis spectrum, and the scanning electronic microscope of the membranes showed that the enzyme had been suitably immobilized inside the membranes.