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Electroactive PCL nanofibers coated by polypyrrole for nerve tissue engineering

Sajjad Shafei
Deakin University, Australia

Electrically excitable tissues like nerve and muscle have shown promising results in regeneration on conductive scaffolds. In this study, 14% solution of PCL electrospun on a rotating collector forms nanofibres with the average diameter of 430 nm. The fibre mats are dip coated by the conducting polymer PPy (polypyrrole) to form a substrate capable of stimulation of nerve cells. 90% porosity of the conductive scaffold along with the mechanical properties which is improved compared to PCL fibres without coating, meet the required properties of nerve scaffolds. PC12 cells along with nerve growth factor, are cultured on the aligned nanofibers and stimulated by a constant voltage of 0.01 V/cm for 1 h/day for three days. Formation of neurites in the direction of fibres suggests that the electroactive PCL-PPy scaffold can support the differentiation of PC12 cells into nerve cells. The flexible and stable fibrous scaffold with conductivities ranging up to 1.9 S/cm shows the potential applications of these membranes in neural tissue engineering.

sshafei@deakin.edu.au

The effect of ionic charge carriers in 2-hydroxyethyl cellulose solid biopolymer electrolytes doped glycolic acid via FTIR-deconvolution technique

M I N Isa and **A N A Bashirah**
Universiti Malaysia Terengganu, Malaysia

The Fourier transform infrared (FTIR) spectrum of 2-hydroxyethyl cellulose (2HEC) doped with glycolic acid (GA) solid biopolymer electrolytes (SBE) samples has been deconvoluted in the wavenumber region between 1160 and 1300 cm^{-1} in order to investigate the percentage of free and contact ions in the samples. Through solution casting method, 2HEC was complexed with different composition of GA and sample with 40 wt.% GA achieved the highest ionic conductivity at room temperature of $4.01x10^{-4}$ $S.cm^{-1}$, two magnitude orders higher relative to the parent host polymer. The FTIR of carboxyl stretching mode was deconvoluted representing the bands of free ions, contact ion pairs and ion aggregates to obtain an insight on the ion associations. The results showed that the number of free ions increases and attain maximum at 40 wt.% GA. The correspondence between free ions, contact ion pair, ion aggregates and conductivity is obvious. The increase in ion dissociation improves the conductivity, while the formation of contact ion pair and ion aggregates reduces it. The calculated ionic species of the 2HEC-GA complexed system from Transference Number Measurement (TNM) confirmed that the system is predominantly cationic.

ikmar_isa@umt.edu.my