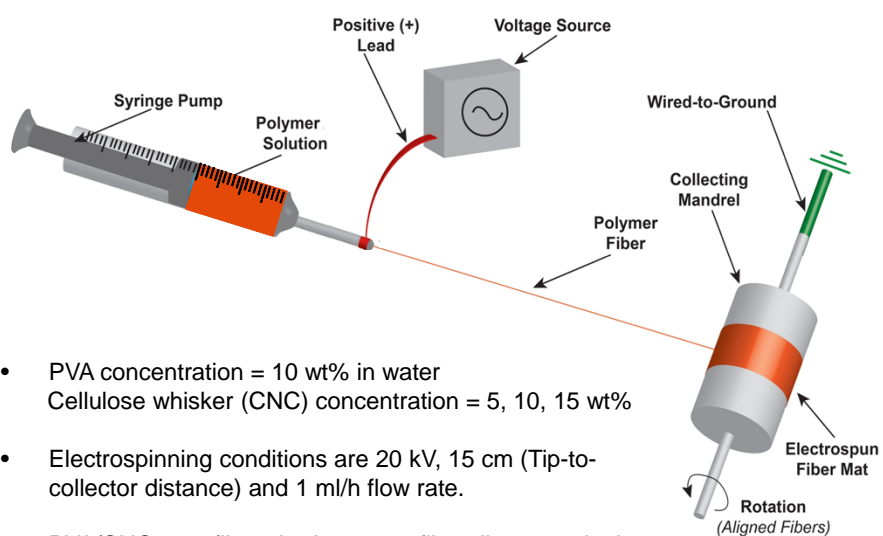


## Stress-Transfer and Local Orientation in Cellulose Whisker/poyl(vinyl alcohol) Nanofibres

Nandula Wanasekara, Charles Douch, Stephen J. Eichhorn



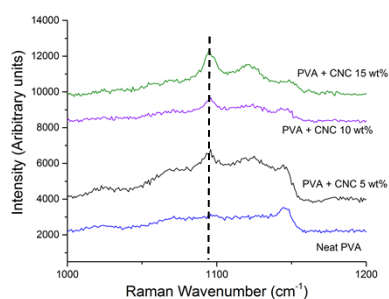
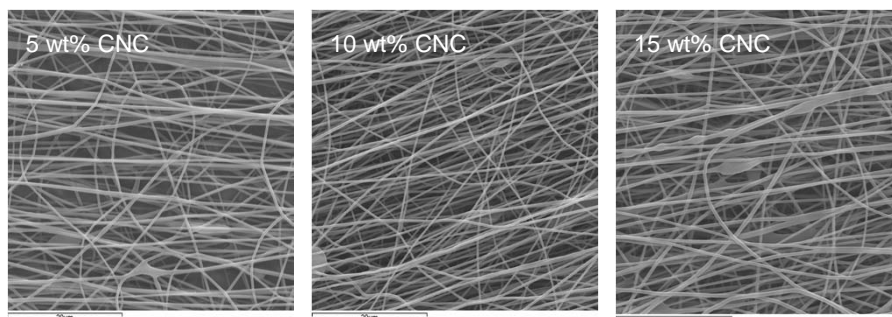
### Electrospinning cellulose whisker/PVA



- PVA concentration = 10 wt% in water  
Cellulose whisker (CNC) concentration = 5, 10, 15 wt%
- Electrospinning conditions are 20 kV, 15 cm (Tip-to-collector distance) and 1 ml/h flow rate.
- PVA/CNC nanofibres had average fibre diameters in the range of 250-450 nm.

2

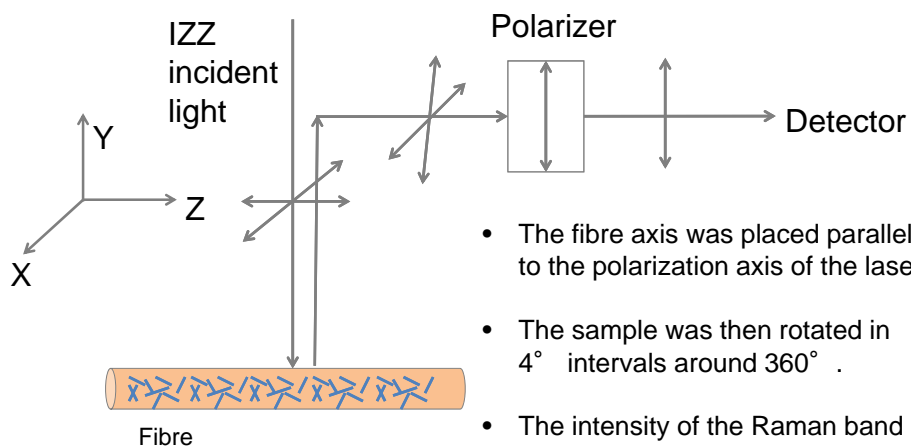
## Fibre morphology and Raman spectroscopy



- Characteristic cellulose peak at  $1095\text{ cm}^{-1}$  confirming the presence of CNC in PVA fibres.
- PVA/CNC 15 wt% has the highest peak intensity.

3

## Orientation mapping using Raman

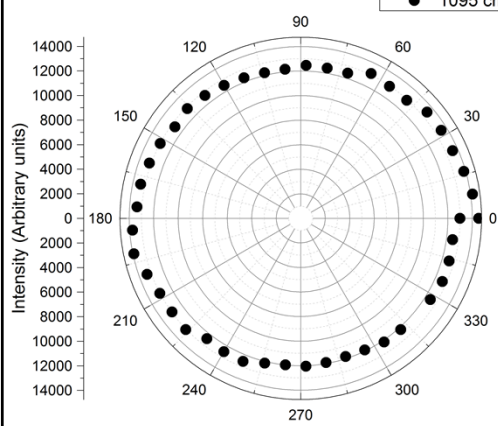


- The fibre axis was placed parallel to the polarization axis of the laser.
- The sample was then rotated in  $4^\circ$  intervals around  $360^\circ$ .
- The intensity of the Raman band located at  $1095\text{ cm}^{-1}$  was recorded at each position.

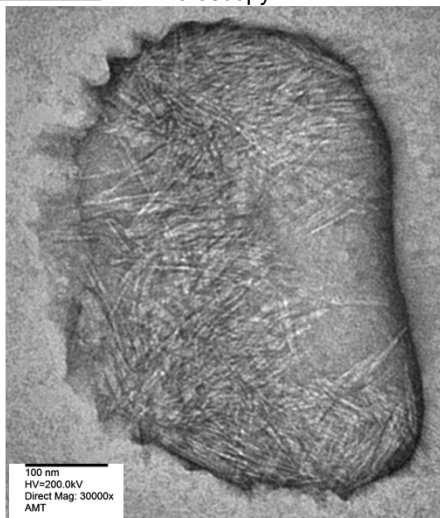
4

## Cellulose whisker orientation in PVA fibres

Raman Spectroscopy



Transmission Electron  
Microscopy



- Overall isotropic orientation with domains of local orientations

5