

# BT5130 – Tissue Engineering – Assignment 1

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**Question:** What are the required properties for a polymer to be "electro-spinnable"

- A **very high surface to volume ratio** – The property makes the electrospun material suitable for physical contact with any (every) material in its environment. For example, cell adhesion to the fibre, filtration, etc. [1]
- A relatively **defect free structure at the molecular level** – This property ensures that the materials have a very high mechanical strength. The composite materials that are made out of this polymer usually ensures high strength. [1]
- **Higher molecular weight polymer** is generally preferred as it facilitates higher chain entanglement which in turn is responsible for the formation of fibres during spinning. Low molecular polymer when electrospun, may break into beads/ droplets. [2] The rheological and electrical properties such as viscosity, surface tension, conductivity and dielectric strength are affected by the molecular weight. [3]
- **Polyelectrolytes** have been shown to influence its electro-spinnability by **negative or positive high voltage**. Polymers with positively charged ions was shown to spinddle properly with positive high voltage since in negative voltage scenario, they adhere to the spinneret surface and do not form fibres [2].
- **Solution properties** that affect spinnability [4] –
  - Conductivity
  - Viscosity
  - Surface tension
  - Solvent volatility
  - Solution Phase Transitions

## Reference

1. Zagho, M. M. & Elzatahry, A. Recent Trends in Electrospinning of Polymer Nanofibers and their Applications as Templates for Metal Oxide Nanofibers Preparation. *Electrospinning - Material, Techniques, and Biomedical Applications* (2016) doi:[10.5772/65900](https://doi.org/10.5772/65900).
2. Electrospinning Polymer Properties. <http://electrospintech.com/polymer.html#.X2cli2gzbiU>.
3. Nayak, R. & Padhye, R. Nano Fibres by Electro spinning: Properties and Applications. *JTEFT* 2, (2017) doi: [10.15406/jteft.2017.02.00074](https://doi.org/10.15406/jteft.2017.02.00074).
4. Electrospinning Solution Properties. <http://electrospintech.com/solution.html#.X2dFXGgzbiU>.