Structural insights into semicrystalline states of electrospun nanofibers by SAXS and WAXD

1. Introduction

- Electrospinning has been established as a technique to produce nano- and micron-sized fibers, seeking to address a growing interest in biomedical and tissue engineering, energy storage, and environmental applications.
- The effectiveness of these fibers is sensitive to variation in molecular arrangement affecting the internal structure, being highly dependent on the polymer type, the spinning solution properties, and the spinning parameters.
- Through small- and wide-angle X-ray scattering detailed structural insights of Poly(vinylidene fluoride-co-hexafluoropropylene) (PVDFhfp) has been obtained.

2. Fabrication

- Figure 1. Schematic of electrospinning setup for producing aligned and non-aligned nanofibers.

3. Results

- Scanning Electron Microscopy (SEM), > 1 μm
- Atomic Force Microscopy (AFM), < 1 μm
- Small Angle X-ray Scattering (SAXS), 1-100 nm
- Wide Angle X-ray Diffraction (WAXD), < 1 nm

4. Conclusion and Outlook

X-ray scattering-based approach has been developed to understand the nanofiber morphology which will allow an improved control of nanofiber development during fabrication through detailed feedback and further attunement of nanofiber properties.