

# New green carbon fibres made from lignin: in-situ study of their graphitisation by X-ray scattering



PhD student: Lucie Dieval, Thesis director: Pascale Launois, Thesis co-directors: Milo Shaffer and Agnieszka Brandt-Talbot

### Context:


  
 PAN carbon fibre
   
 $\text{PAN} = \text{€}1.6/\text{kg}$ 
  
 Petrochemical [1]

- Lignin:**
- Renewable
  - High carbon content (35 – 50 %) [2]
  - Low cost (€0.3 – 0.5 /kg) [2]

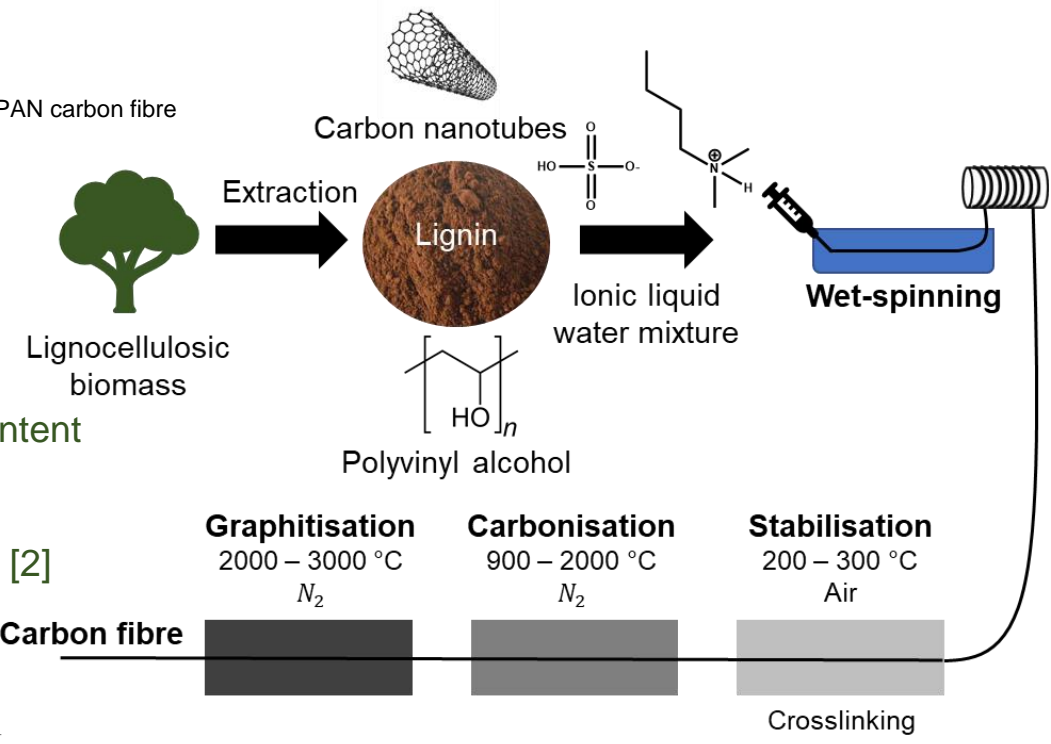


Figure 1: Green Carbon fibre's manufacturing

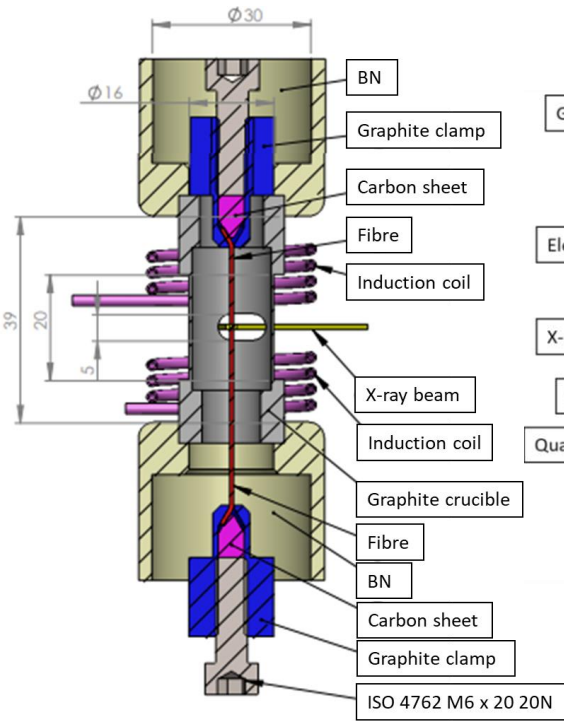


Figure 2: Furnace for stabilisation and carbonisation

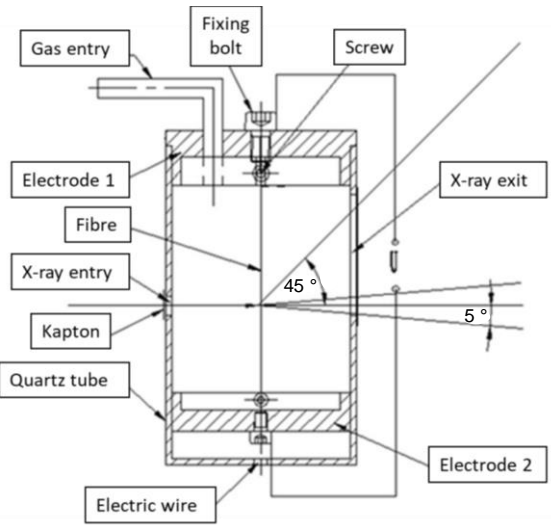


Figure 3: Furnace for graphitisation from [4]



### Objectives: In-situ characterisation of carbon fibres made from lignin

- WAXS : structural properties (crystallite size, interlayer distance, crystallite orientation)
- SAXS : pores properties (formation and orientation)

**References:**
  
 [1] S. Nunna et al., Heliyon (2019)
   
 [2] D.A. Baker, T. G. Rials 2013; J App Polymer Sci
   
 [3] Crestini, 2017, Green Chemistry, 19, 4104
   
 [4] Peng Xiao, et al. (2021), Instrumentation Science & Technology