

Template Synthesis in Hydrodynamically-Aligned Supramolecular Nano-channels

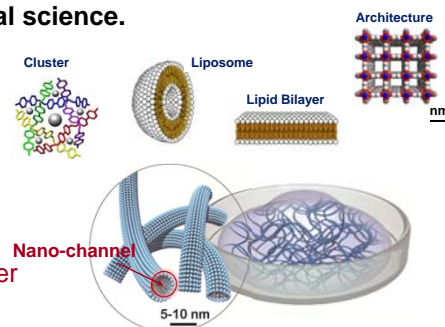
Dr. Daisuke KIRIYA, Dr. Hiroaki ONOE, et.al (Takeuchi Lab, University of Tokyo)

1. Hydrodynamically-Aligned Supramolecular Nano-channels

- Supramolecular assembly has been essential from material science to biological science.
- **Nanochannel** is expected as a nano-scale reaction vessel.

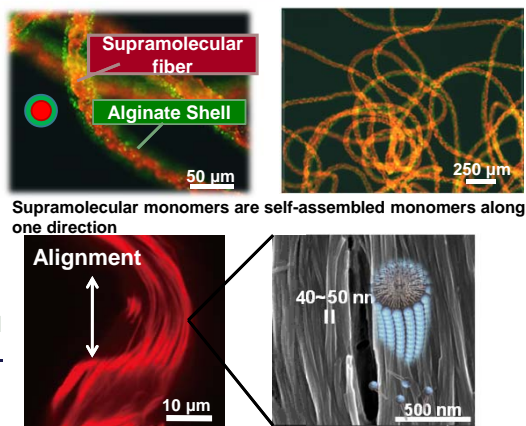
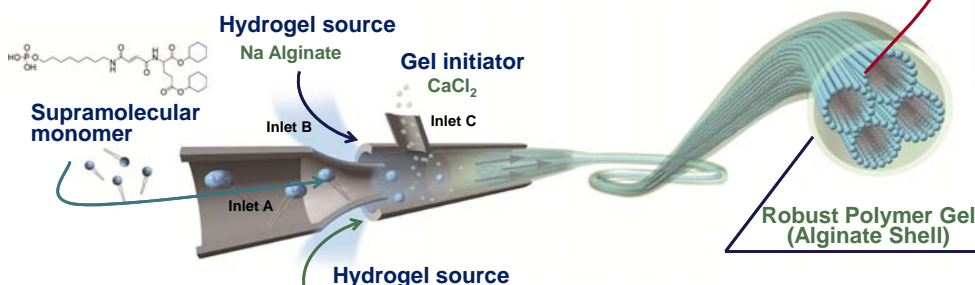
Two problems to solve

1. Entanglement of supramolecular nanofibers
 ➔ Need to prevent entanglement by using "Microfluidics"
2. Poor handle-ability because of low mechanical strength
 ➔ Need to increase mechanical strength by encapsulation in a robust polymer



2. Synthetic Process

- Linearly-aligned Jacketed supramolecular fibers are fabricated in a coaxial flow microfluidic device.



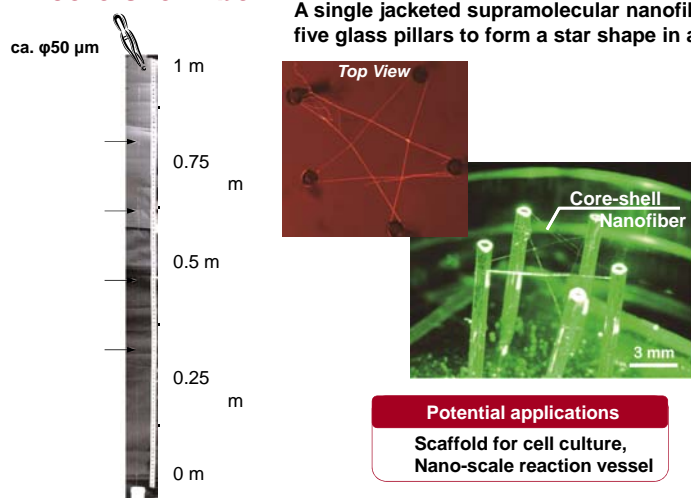
3. Handling of Supramolecular Nanofibers

- Appropriate features for practical applications
 1. Aligned supramolecular nanofibers
 2. Easy-to-handle core-shell nanofibers

• Meter-long core-shell fiber

• Sufficient strength

A single jacketed supramolecular nanofiber bridging five glass pillars to form a star shape in air

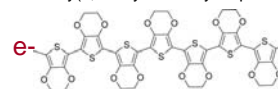


4. Synthesis as Reaction Vessels

- Template Synthesis in Hydrophobic Nano-Channels

PEDOT is extensively applied as a **conductive polymer**, however, its insolubility makes pure PEDOT difficult to handle.

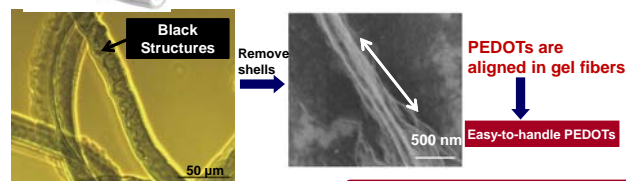
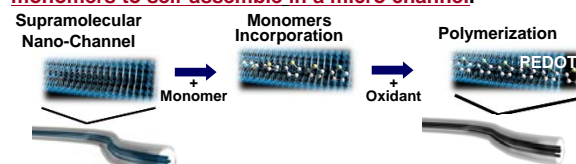
PEDOT Poly(3,4-ethylenedioxythiophene)



Potential applications
 Biochemical molecules, proteins, nano-particles, metals for generating large oriented materials, etc.

- Polymerization of PEDOTs

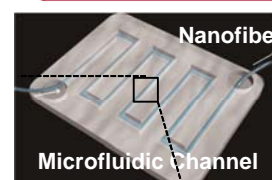
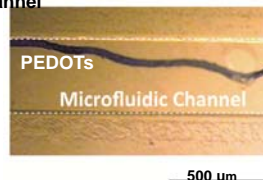
The process involves a step of causing **supramolecular monomers to self-assemble in a micro channel**.



Potential applications
 Flexible organic circuits, Sensors

- Example Application

PEDOTs incorporated in microfluidic channel



5. Patent available for licensing

Patent No. : WO2011/089753
 (US, JP)

Contact : Miho OKISHIRO (JST)
 phone: +81-3-5214-8486
 e-mail: license@jst.go.jp