UNSW SYDNEY | Australia's Global University

School of Chemical Engineering

Next Generation Polymyer Manufacturing

A simple, scalable and widely applicable technique to produce polymers using low energy

Technology:

- **Using low energy visible light as trigger, this technology is able to efficiently prepare advanced polymer materials with a variety of purposes.**
- **This technology uses a small amount of photocatalysts for the polymerization activation and deactivation. By this process, well-defined polymer structures can be prepared with a tuneable molecular weight.**

Benefits:

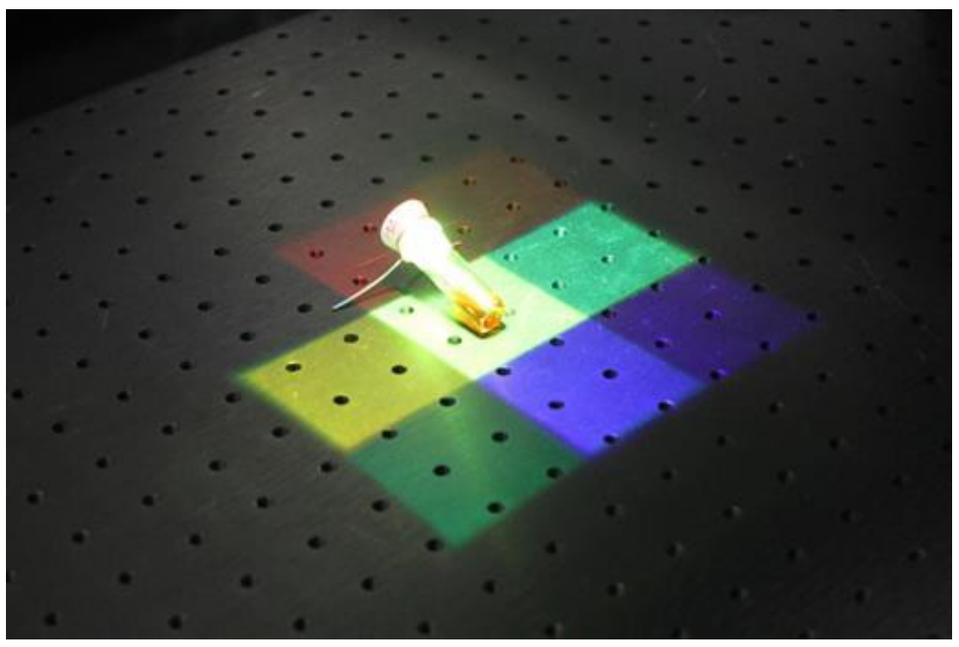
Compare to traditional living polymerization techniques, this technology has the following "green" attributes:

- **Low energy consumption and high atom efficiency;**
- **Scalable reaction setup;**
- **Fast reaction and polymer production (few minutes);**
- **Accurate control of the polymer architectures (block, star, dendritic copolymers, etc.);**
- **Insensitive to air and moisture;**
- **Applicable to a broad range of solvents (including water, etc.) and monomers (commercial and natural monomers);**
- **Spatial and temporal control (3D printing)**

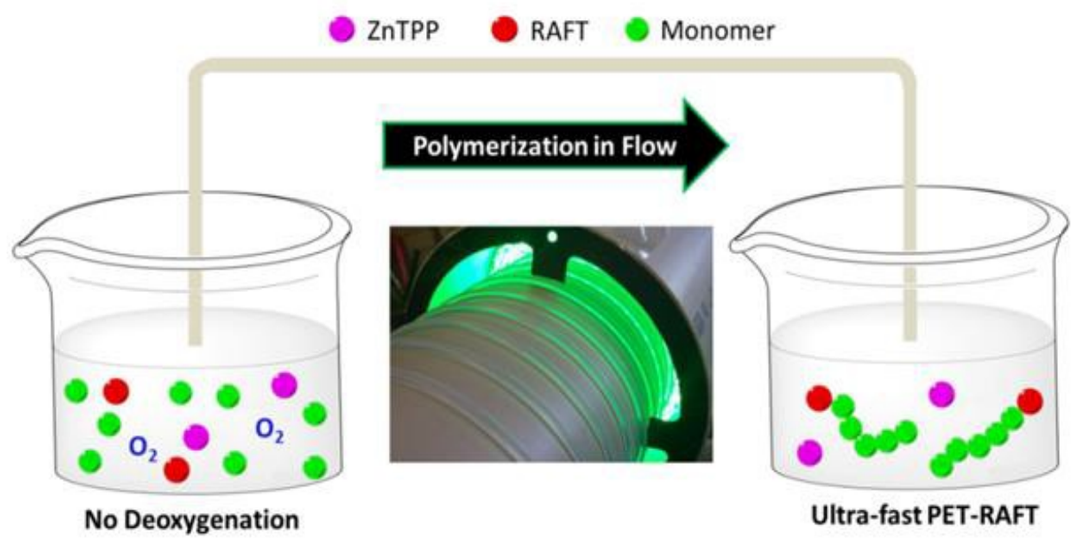
Multiple applications:

- **Continuous production of polymers using a flow reactor;**
- **Surface modification and surface patterning;**
- **Polymer nanoparticles with accurate sizes and functionalities;**
- **Polymer additives, adhesives, compatibilizers, etc.;**
- **Nanolithography and photolithography;**
- **Pharmaceutics (Precision polymer synthesis);**

Easy manipulation by controlling the wavelength

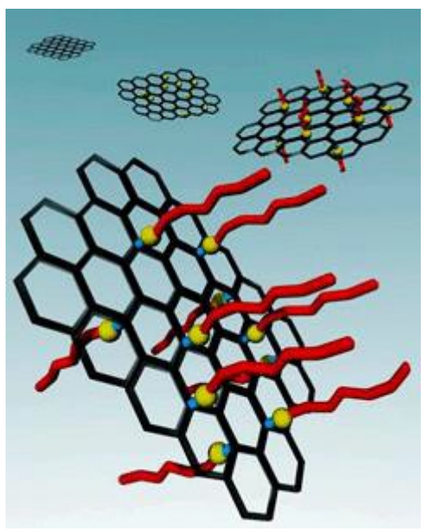


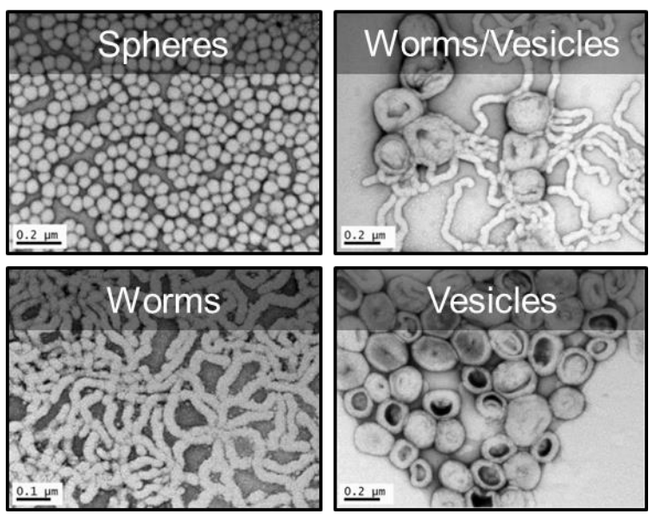
Easy setup — Continuous flow reaction:



Advanced materials synthesis:

Hybrid materials for energy **Nanoparticle synthesis**





About the team: **A/Prof Cyrille Boyer and Dr Jiangtao Xu**

- **A/Prof Cyrille Boyer** has received his PhD from the University of Montpellier (France) in collaboration with Solvay Solexis on the preparation of new adhesives for polypropylene and poly(vinylidine fluoride). Then, he worked with Dupont Performance Elastomers for the preparation of perfluoroelastomers. Cyrille received the Prime Minister's Prize for Physical Science in 2015, LeFevre Memorial Award (awarded by Australia Academia of Science) in 2016 and several international awards, including American Chemical Society Macromolecules Young Investigator Award.
- **Dr Jiangtao Xu** received his PhD in polymer chemistry from Fudan University in China. He is working as Research Fellow to develop robust and versatile visible light-mediated living radical polymerization.

This technology has been patented: J. Xu & C. Boyer, Process for preparing a polymer, PCT Int. Appl. WO/2015113114. (National phase);

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Torch Innovation Precinct at UNSW

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