

# Polyacrylonitrile-Modified Starch Nanoparticles by Cerium (IV)- Promoted Grafting

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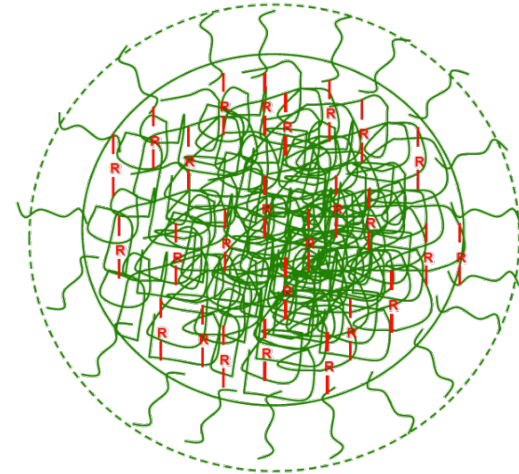
May 3, 2017



# BACKGROUND

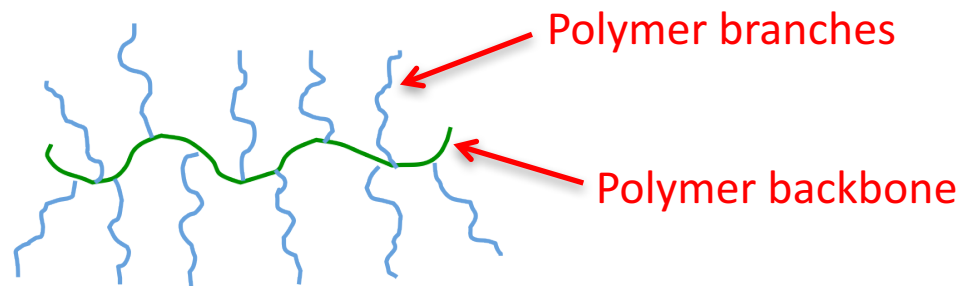
## ○ Starch

- Several advantages: Biocompatible, renewable and biodegradable
- Hypothesized structure of a starch nanoparticle (SNP)



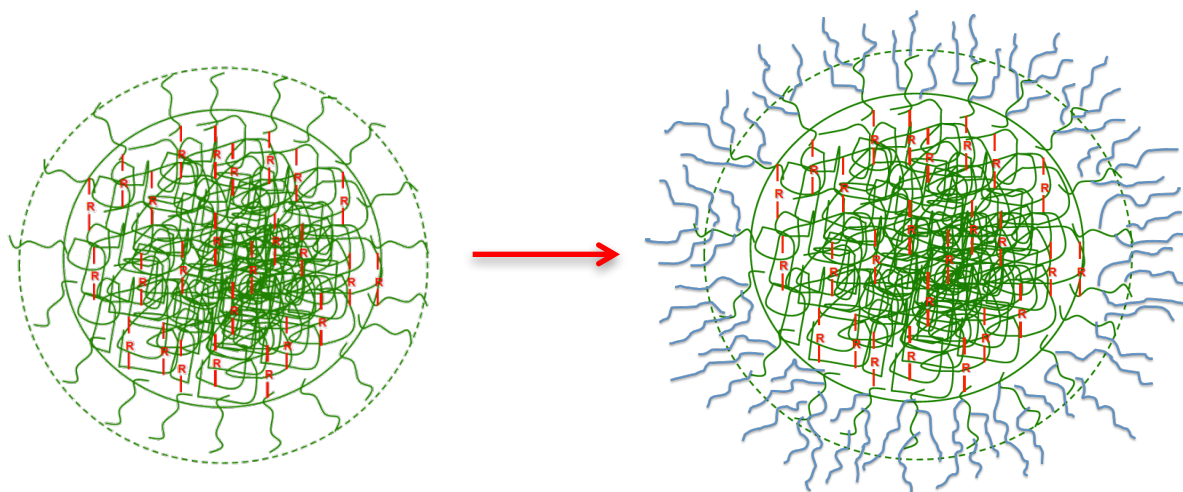
## ○ Graft Copolymers

- Can display characteristics of two distinct polymer phases
- May display micelle-like properties



# RESEARCH GOALS

- Synthesize graft copolymers from starch nanoparticles by cerium (IV)-promoted grafting
- Determine the reaction parameters/conditions to:
  - Vary the starch and graft polymer contents
  - Control the hydrophilic-hydrophobic balance
- Characterize the modified starch nanoparticles

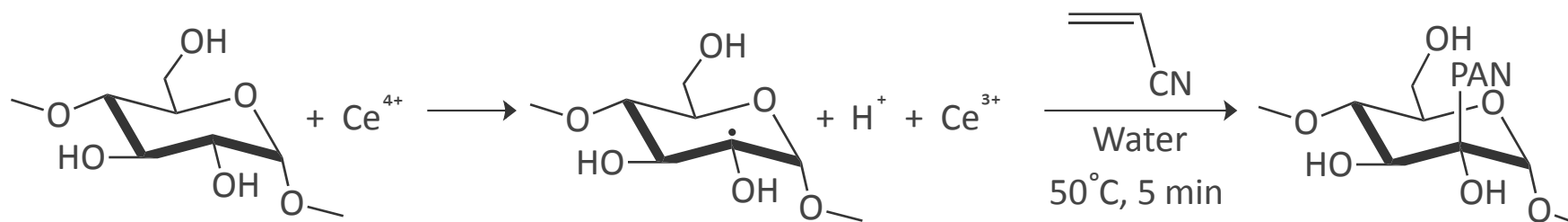


# EXPERIMENTAL PROCEDURE

## ○ Synthesis of modified SNPs (mSNPs) with Cerium (IV)

- *Grafting from* technique
- Homopolymerization is significantly reduced
- Redox reaction with hydroxyl-containing polymers

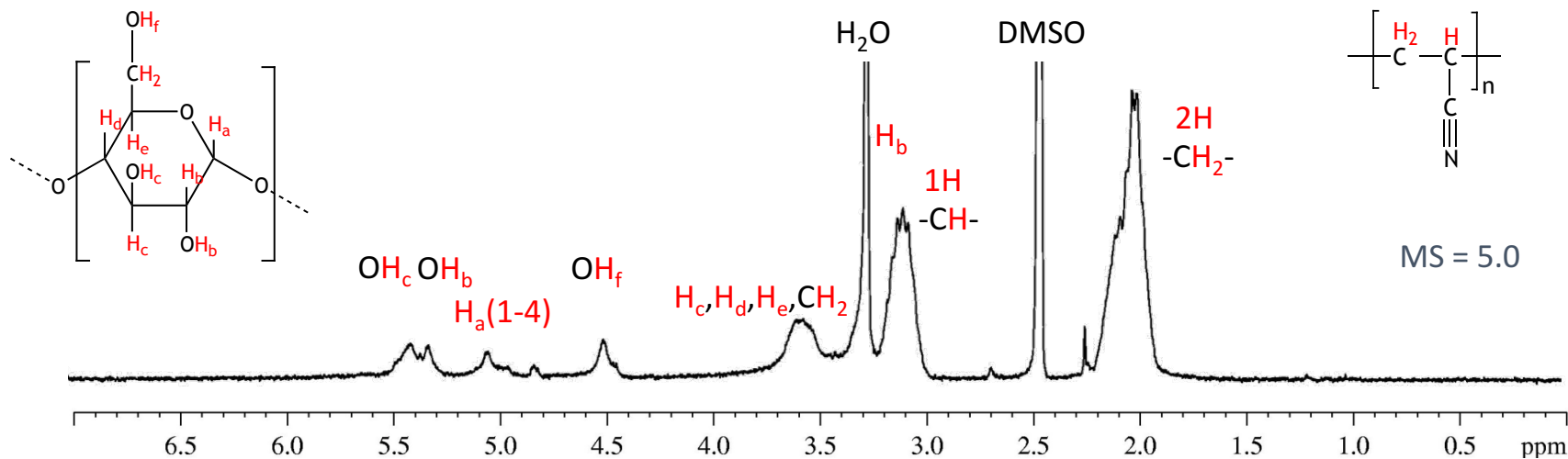
## ○ Reaction Scheme:



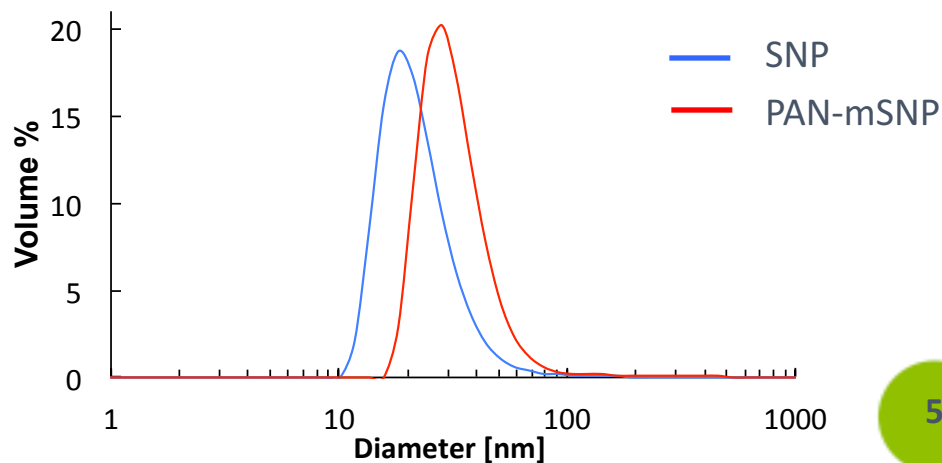
# RESULTS

## ○ Characterization Techniques

- <sup>1</sup>H NMR Spectroscopy



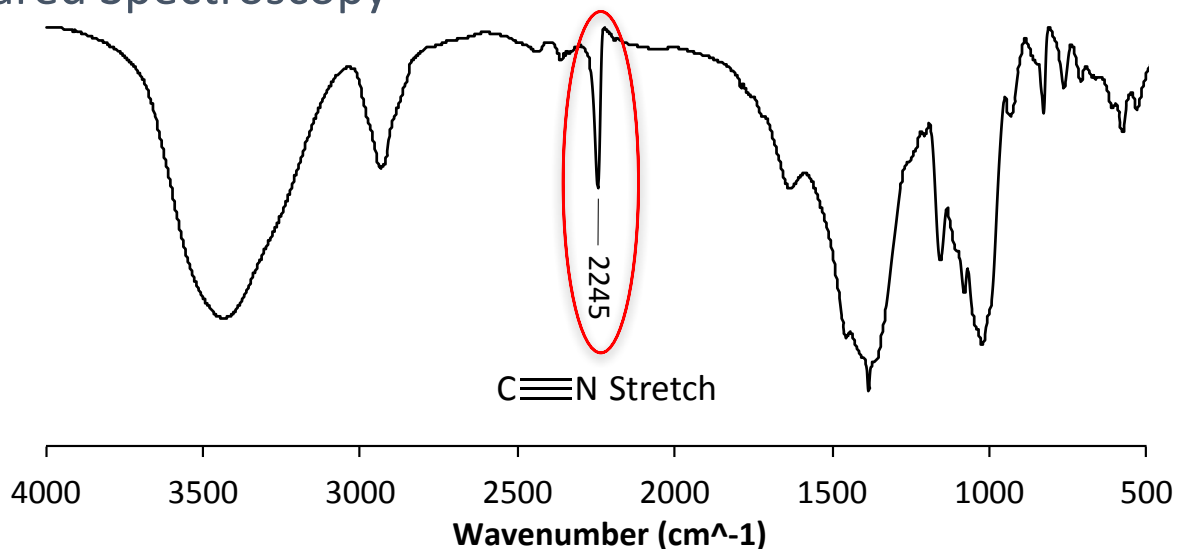
- Dynamic Light Scattering
  - Increase in particle size



# RESULTS

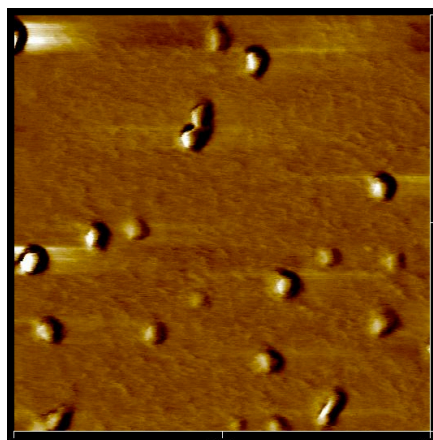
## ○ Characterization Techniques

- FT-Infrared Spectroscopy

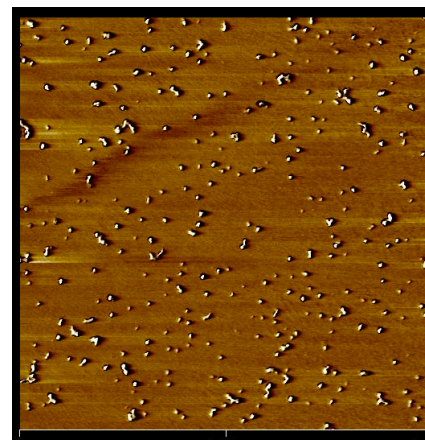


- Atomic Force Microscopy

- Degradation of mSNPs with MS = 5.0
- Hollow PAN shell obtained



Scale = 500 nm



Scale = 2  $\mu\text{m}$

**Thank you!**