

Abstract

Mucus is a network of complex biomolecules that serves many functions including barrier formation and lubrication. Biological samples can be hard to obtain and study, creating the need for a synthetic alternative. This project sought to develop part of a model system that would show a change in fluorescence output upon gelling. This can be done using a polymer composed of two monomers: poly-**NIPAM** gels above room temperature and dansyl fluorophore changes fluorescence in the gelled environment. Here we report the synthesis of the dansyl monomer and polymerization with NIPAM.

Background

Mucus and Mucins:

- Protects and fights against infectious germs and viruses which invades the human body
- Mucin molecules are made of a protein backbone decorated with sugars
- Mucins cause mucus to gel (1)

Poly-NIPAM: Why is it Thermoresponsive?

- Phase transition at 32 °C
- Below 32°C, the molecule
- hydrogen bonds with water
- Above 32 °C, the hydrogen bonds break down and hydrophobic effects cause the molecule to aggregate in a hydrogel (2)

Dansyl And Fluorescence

- Dansyl monomers have been previously synthesized
- The dansyl fluorophore has a different fluorescent signature in hydrophilic versus hydrophobic environments (3)







Synthesis of a Fluorescent, Thermoresponsive Aqueous Polymer System Tammy Le, Ariana Remmel, Kamil Godula, PhD

Procedure

Step 1: A solution of dansyl chloride in THF was first added to a cooled (0 °C) solution of ethylenediamine. It was then stirred at 0 °C for 3 hours before adding sodium hydroxide. The THF was evaporated afterwards and the aqueous layer was extracted with chloroform. The solution was then recrystallized from benzene and kept overnight.

Step 2: Acryloyl chloride was distilled and added dropwise to a solution of the previous molecule with triethylamine in THF at room temperature. The solution was stirred overnight The solution was then filtered, concentrated in *vacuo*, and purified by column chromatography (ethyl acetate/ether gradient on silica).



Rotovap solution of dansyl



Green lining after rotovap



Procedure

The dioxanes were filtered over basic alumina. All reagents were weighed out in a flame dried flask. The solution was then freeze, pump, and thawed four times to remove oxygen. Afterwards, it was warmed to room temperature before stirring at 65 °C for 6 hrs. The polymer was then precipitated in ether to purify.





Polymer



Precipitation in ether

