Synthesis of Graft Copolymers using Diels-Alder chemistry

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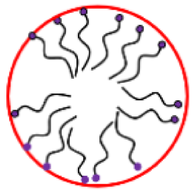
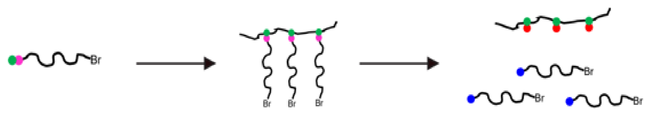
Introduction

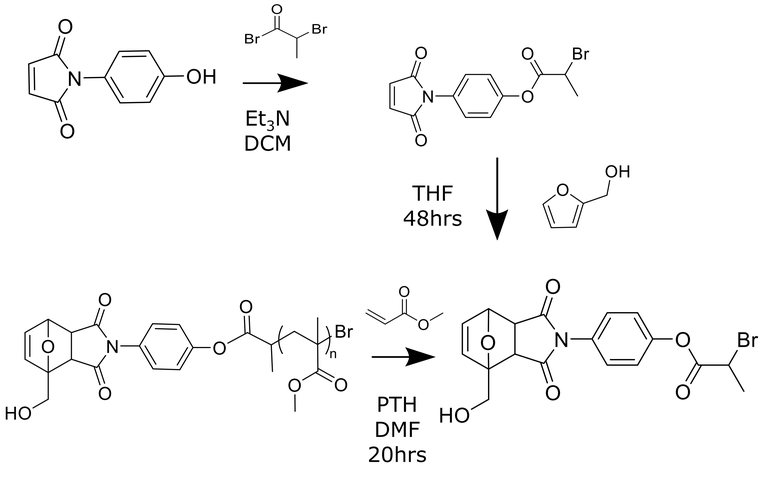
- Water soluble polymers: create surfactants
- Surfactants are soap, detergents, foaming agents etc
- Phenolic maleimide starting material to synthesize polymer
- Polymer graft to use Diels-Alder to synthesize and break apart arms and backbone
- Potential use to clean up oil

Project Goal



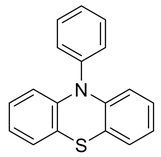


Synthetic Route (Building the arms)



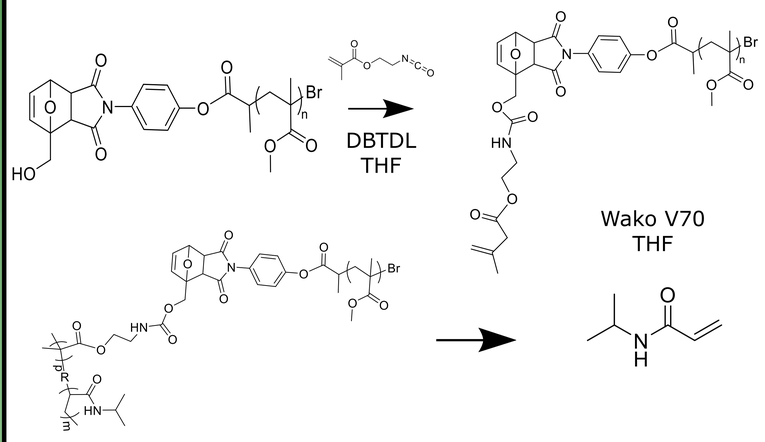
hv-ATRP

Light atom transfer radical polymerization (hv-ATRP) is a controlled synthetic method for polymerizing. In hv-ATRP a photoinitiated catalyst is used for radical formation. hv-ATRP does not progress in the absence of light.

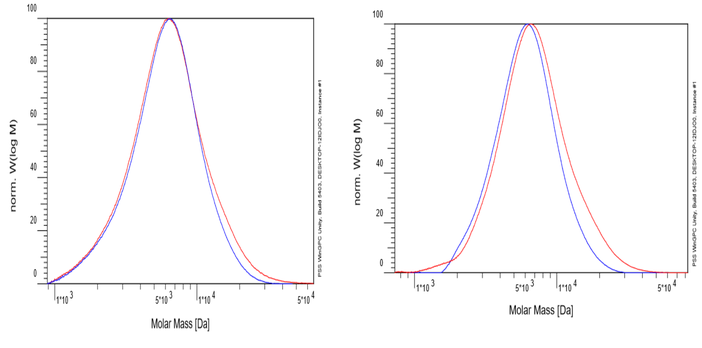


- Becomes Photoexcited
- Activates alkyl halide
- Generates radical
- Deactivates radical
- Returns to ground state
- (Ph-PTZ)

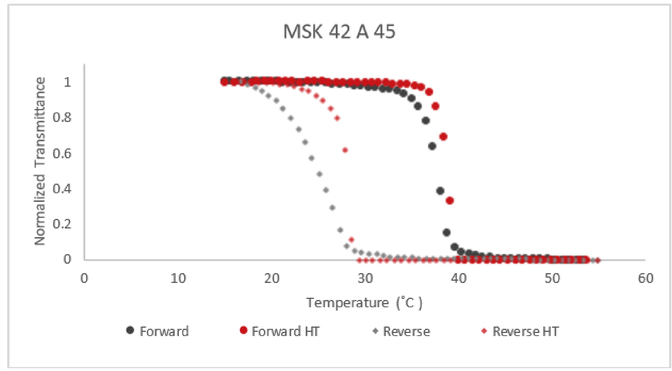
Synthetic Route (Building backbone)



Gel Permeation Chromatography (GPC) Verifying the arms



Lower Critical Solution Temperature



Dynamic Light Scattering

Compound	Radius (nm) 2 mg/mL	0.2 mg/mL	0.02 mg/mL
MSK 36 A 39	46.3	48.6	-
MSK 36 A 39 HT	39.6	42.4	-
M_V 14 A 16	40.8	38.8 (35.2, 30.1)	66.7 (50.2)
M_V 14 A 16 HT	31.8	33.2	7.6 (37.6)
M_V 15 A 17	45.6	75.2 (70.7)	18.1
M_V 15 A 17 HT	34.8	40.3	39.2
M_V 16 A 18	87.9	84.0	51.7
M_V 16 A 18 HT	30.1	31.8	13.4 (32.8)
MSK 39 A 42	36.2	38.5	-
MSK 39 A 42 HT	36.0	32.4	-

Future work

- Test different ratios of NIPAM to arms for water solubility, LCST, DLS
- Test different degrees of polymerization for arms (DP)
- Dye testing

Acknowledgements

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