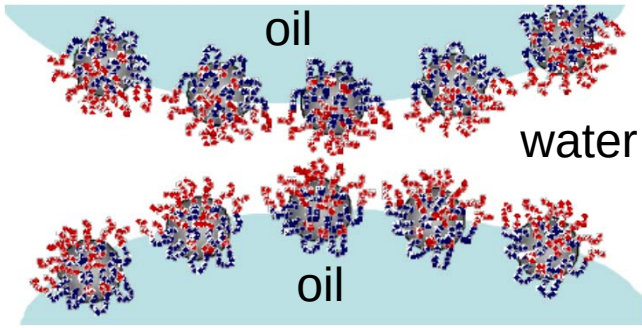
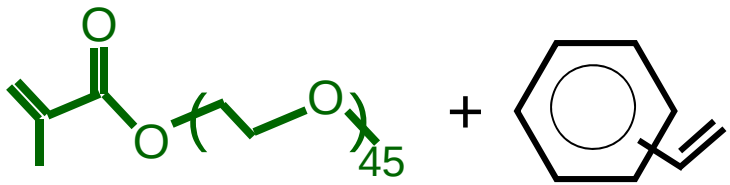
Miktoarm Star Copolymers as High Efficiency Nanoparticulate Emulsifiers

Robert D. Tilton, Department of Chemical Engineering and Department of Biomedical Engineering, Carnegie Mellon University, Pittsburgh, PA 15213.

- Miktoarm star copolymers are nanoparticles that have more than one type of polymer arm surrounding a cross-linked polymer core.
- Adsorption of star copolymers to the oil/water interface is enhanced by the amphiphilicity of the arms.
- Amphiphilicity is controlled by incorporating arms with different solubilities into the same star or using one type of arm with monomers that are amphiphilic.
- Atom transfer radical polymerization is used to prepare stars via macromonomer or macroinitiator approaches.

- When adsorbed at oil/water interfaces, water-soluble arms extend into the aqueous thin film between drops
- Large star copolymer adsorption energies stabilize emulsions
- Emulsions are stabilized for months using just 0.008 wt% emulsifier.

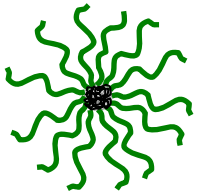




+

CuBr/TPMA

80°C, anisole



PEO Star with hydrophobic core

diameter ~ 30 nm

arm M_n ~ 2,000