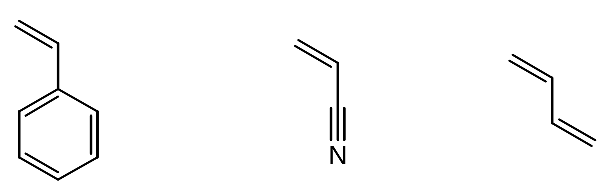
Chem/MatS/ChEn 4223W

Assignment 2

Due: *In Lab*, Tuesday, February 5/Thursday, February 7

In Lab 2, you will prepare statistical copolymers by radical polymerization, and you will determine the reactivity ratios of those two monomers in a free-radical copolymerization. Copolymerization of different monomers is a useful way to obtain polymers that have physical properties that are intermediate between those of homopolymers from the same monomers.

One good technological example of this is the statistical copolymer of styrene and acrylonitrile. Poly(styrene-acrylonitrile), or SAN, is a rigid yet moldable plastic used in a wide variety of plastic parts. By itself, polystyrene is a moldable, (relatively) flexible polymer with fairly low impact strength. Polyacrylonitrile is more rigid, but also brittle. SAN copolymers, as a result, have intermediate properties of the two components: moldable, rigid, and strong. One disadvantage of SAN is that it breaks on impact failure, so it is sometimes either blended with or grafted from butadiene-acrylonitrile copolymer rubber (also known as “nitrile” or NBR rubber) which toughens the material and helps it deform on impact failure. This combined polymer, ABS (acrylonitrile-butadiene-styrene), is used to make lots of consumer goods. If you are sitting in a chair with plastic parts, and reading this on a computer screen, there is a good chance the both your chair and monitor casing are made of ABS.[1]



styrene acrylonitrile butadiene

In Lab 2, you will be performing free-radical copolymerizations on mixtures of styrene and methyl methacrylate. Perform your polymerizations according to the chart on the next page. (You’ll find your “pair number” on the course website.)

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[1] *Plastics Technology* magazine has ranked the development of ABS resin no. 11 out of the top 50 innovations in the history of plastics; see http://www.ptonline.com/articles/50-ideas-that-changed-plastics.

$f_{styrene}$	pairs 1,9	pairs 2,10	pairs 3,11	pairs 4,12	pairs 5,13	pairs 6,14	pairs 7,15	pairs 8,16
0.15	**X**						**X**	
0.20		**X**						
0.25			**X**					**X**
0.30				**X**				
0.35			**X**		**X**			
0.40						**X**		
0.45				**X**			**X**	
0.50	**X**							**X**
0.55		**X**			**X**			
0.60			**X**					
0.65				**X**		**X**		
0.70					**X**			
0.75	**X**					**X**		
0.80							**X**	
0.85		**X**						**X**

Calculate the amounts of styrene and methyl methacrylate (in milliliters and in grams) you will need for each of your three polymerizations below.