CHEM 231: Organic Form and Function

Laboratory 2

Nucleophilic Substitution[1]

Supplies Needed

For 180 students is needed:

- 1500 mL 15% sodium iodide in acetone (225 g NaI)
- 40 mL 7.5% sodium iodide in acetone (4 g NaI)
- 40 mL n-butyl bromide, neat
- 400 mL n-butyl bromide in acetone, 1M (56 g n-BuBr)
- 25 mL n-butyl bromide in acetone, 2M (7 g n-BuBr)
- 40 mL 2-bromobutane
- 40 mL t-butyl bromide
- 40 mL neopentyl bromide
- 40 mL n-butyl chloride
- 2 L acetone, ACS grade
- 1800 disposable culture tubes

Other supplies for the lab:

- 2 x Metrohm dispensers, set to deliver 1.0 mL
- 10 x Eppendorf pipets, set to deliver 200 μL
- 8 x Eppendorf pipets, set to deliver 100 μL
- 1 x 1L amber bottle for dispenser
- 1 x 500 mL amber bottle for dipenser
- 18 x 25 mL amber bottles for reagents

Supplies for prep:

- 1 L volumetric flask
- 500 mL volumetric flask
- 50 mL volumetric flask

[1] Adapted from *Microscale and Miniscale Organic Chemistry Laboratory Experiments* by Schoffstall, Gaddis, and Druelinger

Solutions and Supplies Prep

1. 15% Sodium iodide solution. Add 150.0 g of NaI into a 1L volumetric flask; fill almost full with acetone, ACS reagent grade. Swirl vigorously to dissolve; dilute to mark with acetone; stopper and mix well. Transfer to a 1L bottle or flask; let stand 1 h for undissolved solids to settle; carefully decant into 1L amber bottle. Connect Metrohm dispenser set to 1.0 mL delivery. Label "15% sodium iodide in acetone".

   Dispense 20 mL of this solution into two amber dropper bottles with normal closures. Label "15% sodium iodide in acetone". These will be used for the rate law determinations.

2. 7.5% Sodium iodide solution. Measure 25.0 mL of the 15% NaI solution into a 125 mL Erlenmeyer flask; dilute with 25.0 mL acetone, ACS reagent grade. Evenly divide into two amber dropper bottles with normal closures. Label "7.5% sodium iodide in acetone". These will be used for the rate law determinations.

3. 1M n-Butyl bromide solution. Add 68.5 g of n-butyl bromide into a 500 mL volumetric flask; fill to mark with acetone, ACS reagent grade; stopper and mix well. Transfer to a 500 mL amber bottle. Connect Metrohm dispenser set to 1.0 mL delivery. Label "1M 1-bromobutane in acetone".

   Dispense 20 mL of this solution into two amber dropper bottles with normal closures. Label "1M butyl bromide in acetone". These will be used for the rate law determinations.

4. 2M n-Butyl bromide solution. Add 13.7 g of n-butyl bromide into a 50 mL volumetric flask; fill to mark with acetone, ACS reagent grade; stopper and mix well. Evenly divide into two amber bottles with normal closures. Label "2M 1-bromobutane in acetone". These will be used for the rate law determinations.

5. Neat electrophile solutions. Add about 20 mL of each of the following electrophiles to two 25 mL amber bottles. Label accordingly. These will be used in part one of the experiment:

   a. 1-bromobutane
   b. 2-bromobutane
   c. t-butyl bromide
   d. neopentyl bromide
   e. 1-chlorobutane