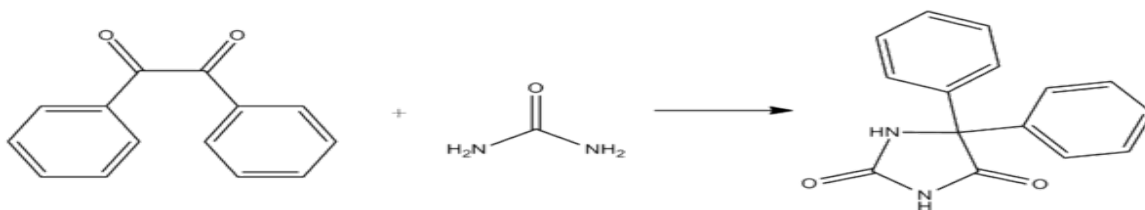


A Benzilic Acid Rearrangement: Making Phenytoin

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Background

Dilantin is a brand name drug on the market that is an anti-epileptic drug with the generic name phenytoin. Phenytoin can be produced with ease from benzil and urea under basic conditions, as shown in the reaction below. The reaction mechanism is unusual and involves an interesting benzilic acid rearrangement, which should be discussed in recitation.



Experimental

Place ~0.5 g benzil (know exact mass) and ~0.25 g urea (know exact mass) in a 25 mL round bottom flask. Add 7.5 mL of ethanol, 3 mL of 20% aq NaOH (aq), and a boiling chip to the solids in the round bottom flask. Gently swirl the mixture to dissolve some of the solids, but it is okay if much of the solid does not dissolve before heating. Attach a water cooled reflux condenser, and heat to reflux gently for at least 1 hr. Throughout the hour, watch for the various color changes of the mixture; it is ok if the solution turns black or purple!

After refluxing, allow the mixture to cool enough that you can handle the round bottom flask; remove it from the condenser and add 12.5 mL of water to your reaction mixture. Gravity filter the solution to remove any side product solid particulates that are sparingly soluble. To the liquid filtrate, add 6 M HCl (usually ~3-5 mL) to acidify the solution and precipitate the product. Collect the solid product by suction filtration, and wash thoroughly with water. Recrystallize the entire product with ethanol. Once dry, obtain the mass and compute the theoretical and percent yield. Characterize your phenytoin product by measuring its melting point range, and its IR, proton and/or carbon NMR spectra, as indicated by your instructor.

CLEAN UP: Combine the reaction mixture filtrate with the recrystallization filtrate, neutralize, and flush down the drain with lots of water. Solid phenytoin should be placed in the solid hazardous waste.