

## Lab 09: Coenzyme Synthesis of Benzoin

### Reading

Pavia, et al. 4<sup>th</sup> edition, Expt. 36, pp. 303–310.

### Prelab Assignment

Your prelab should include the following: Date, Introduction, Haz-Mat, Reactant Table, Chemical Equation, and Procedures.

### Procedural Notes

**Isolation of Crude Benzoin:** If the reaction mixture has not formed a solid after being left for two days, try seeding the reaction. Collect crystals via Hirsch funnel and rinse the crude product with ice-cold water, then let it dry on the Hirsch funnel. Don't forget to weigh the crude product before recrystallizing (we can get a rough idea of how much hot EtOH to use in the recrystallization...).

**Yield Calculation and MP Determination:** We are not going to calculate the crude MP or percent yield. We will calculate percent recovery and percent yield.

**Crystallization of Benzoin:** After filtering the recrystallized product, rinse the crystals with small portions (about 0.5–1.0 mL) of **ice-cold** ethanol. The purified product can be dried in a 100 °C oven for about 15 min before determining the final weight, the melting point, and the IR spectrum. Alternately, you can try to air dry the product via vacuum in your Hirsch funnel for ~10 minutes. Keep your product for the next experiment.

**NOTE:** We will use 0.300 g of our purified product in the next experiment.

### Postlab Questions

*Answer these questions in your lab notebook after your conclusion is a section titled "Post-lab Questions"*

1. What is the impurity that must be removed from the benzaldehyde reagent before it can be used in this experiment?
2. Refer to the essay that precedes the experiment. It gives the structure of thiamine pyrophosphate. Using this structure as a guide, draw a structure of thiamine hydrochloride. The pyrophosphate group is absent in this compound.
3. What is the purpose of adding NaOH to the reaction?
4. Using the information given in the essay that precedes this experiment, formulate a complete mechanism for the thiamine-catalyzed conversion of benzaldehyde to benzoin.
5. What modifications of conditions would be appropriate if an enzyme was used for this reaction?