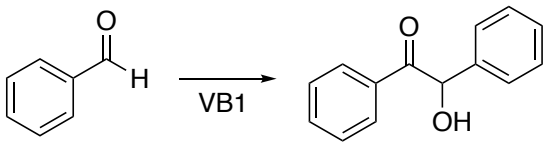
The Benzoin Condensation
Catalytic preparation of benzoin



Procedure:

To a clean 20 mL vial, thiamine hydrochloride (vitamin B1, VB1; 0.13g; 0.39 mmol) is added and dissolved in 400 µL water. To the mixture, 1.5 mL ethanol is added with cooling. Next, 250 µL 3 M NaOH is pipetted into the mixture dropwise while cooling. Then 750µL of freshly prepared benzaldehyde is added. The vial is capped and set aside for a minimum of 24 hours to two weeks at room temperature. If no crystals are evident after one week, cool in an ice bath and scratch with a glass rod to induce formation of crystals. Alternatively, adding a seed crystal of benzoin to the chilled solution may assist in the crystallization of the product. Product is isolated by vacuum filtration and recrystallized (1:1 ethanol/water). After drying, determine mass, record melting point and IR spectrum. Calculate % yield, e-factor, and atom economy.

Pre-lab Questions

Do a little web browsing to see how the benzoin condensation is traditionally catalyzed. What catalyst was traditionally used in place of our thiamine? Explain why our method is more in keeping with the 12 principles of green chemistry.

Reference:

Warner, J. C. In *Greener Approaches to Undergraduate Chemistry Experiments*, Kirchhoff, Mary; Ryan, Mary Ann, Eds., American Chemical Society, 2002, 14-17.