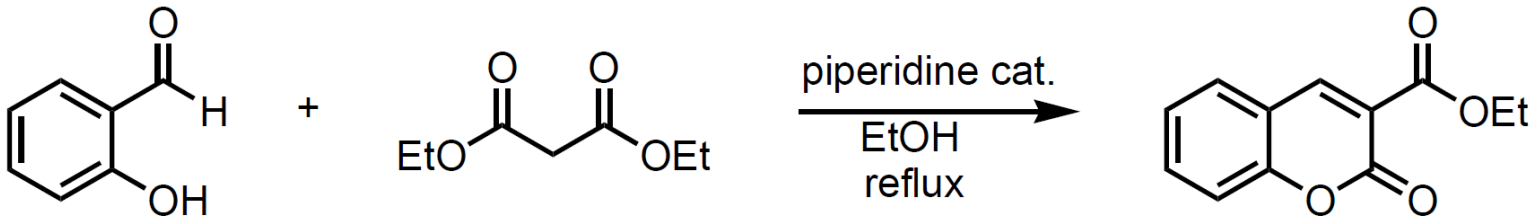
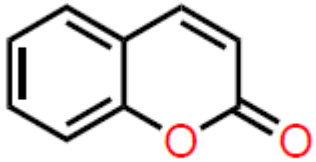
Experiment 4:
Synthesis of coumarins, Knoevenagel condensation



- Synthesis of coumarins
- Chemistry of enolates: Knoevenagel condensation
- Techniques: reflux, cristallization
- Manipulation of toxic substances

Coumarins

- **Found in many plants**



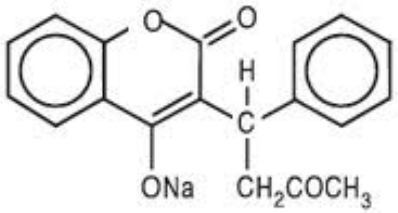
Coumarins

- **Perfums**

Among the most popular ingredients in perfumes coumarin takes pride of place being included in almost 90% of all perfumes! The pliability and versatility of this fragrance note is legendary, accounting for a sweet and fresh facet that rises up from the bottom onto the heart of the fragrance, lingering on the skin for hours and enriching a perfume composition via its scent magic.

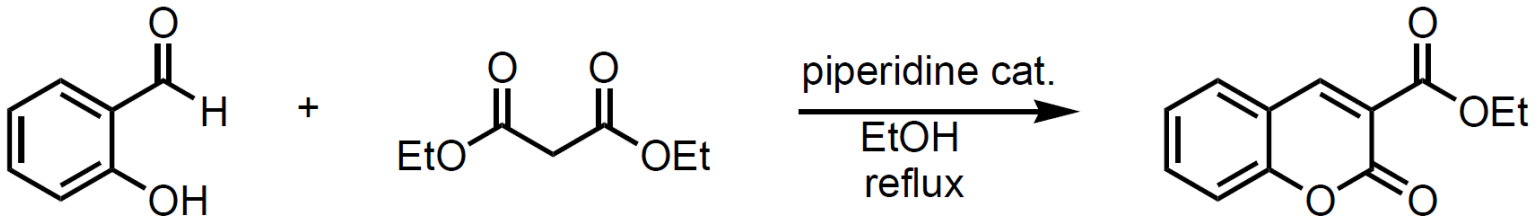
Coumarins

- **Anticoagulants**



Warfarin sodium

Experiment 5:
Synthesis of coumarins, Knoevenagel condensation

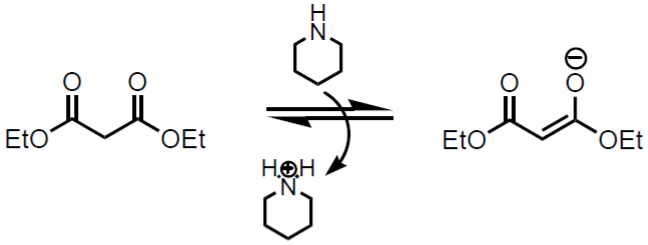


- Knoevenagel condensation + intramolecular transesterification
- **Knoevenagel condensation**: similar to the aldol reaction but now the nucleophile is the enolate of a compound with activated methylene protons

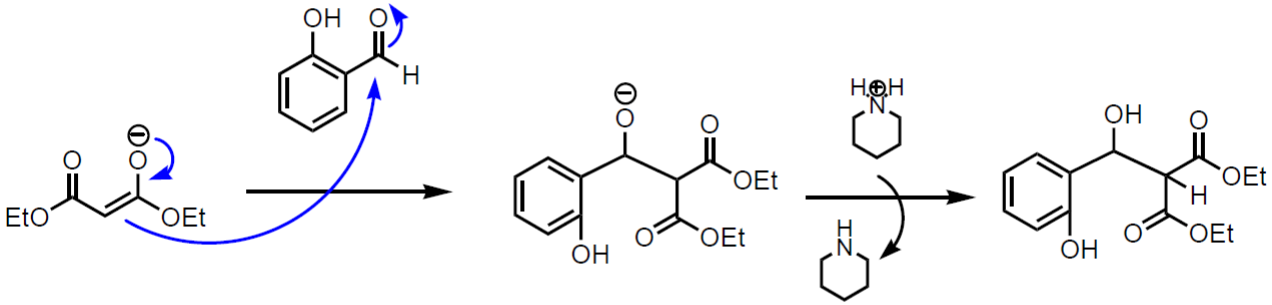
Knoevenagel condensation

Heinrich Emil Albert Knoevenagel
(18 June 1865 – 11 August 1921)

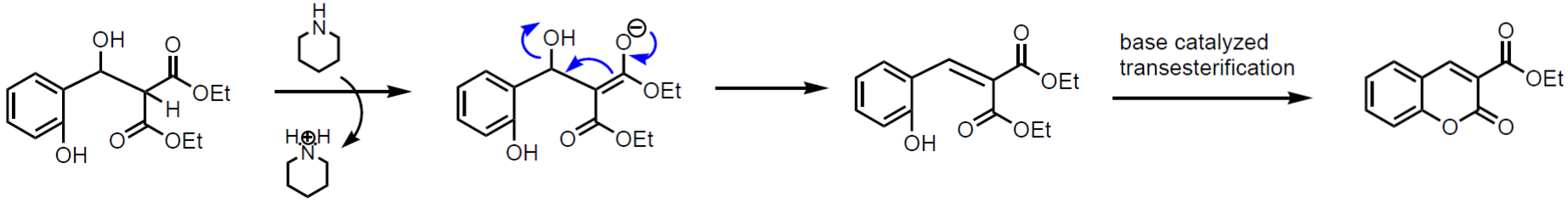
Knoevenagel, E. Condensation von Malonsäure mit Aromatiachen Aldehyden durch Ammoniak und Amine. *Ber. Dtsch. Chem. Ges.* **1898**, *31*, 2596-2619.



Enolate formation



Addition



Experiment 5:
Synthesis of coumarin, Knoevenagel condensation

Aldeide salicilica	
Dietil malonate	
Etanolo	
Piperidina	
Cloruro di metilene	
3-carboetossi cumarina	