

Chapter 6: organic synthesis

ACTIVITY 2 : Benzaldehyde synthesis study

All following documents are issued from the article:

Green synthesis of natural benzaldehyde from cinnamon oil catalyzed by hydroxypropyl- β -cyclodextrin.

Hongyan Chen, Hongbing Ji, Xiantai Zhou, Lefu Wang, 12 June 2010.

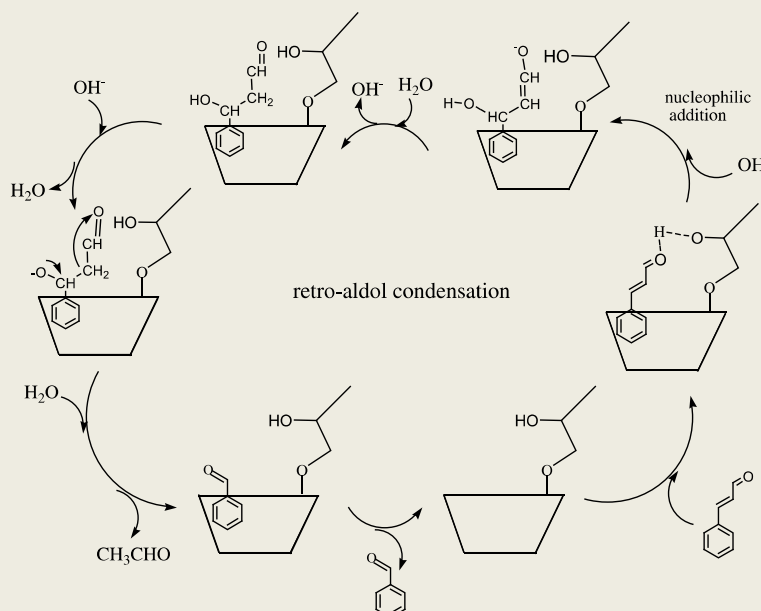
DOCUMENT 1: Influence of temperature on benzaldehyde yield

Temperature (K)	Reaction time (h)	Conversion of cinnamaldehyde (%)	Yield of benzaldehyde (%)
313	6	86	52
323	5	95	70
333	4	90	68

Reaction condition: 2-HP β -CD/cinnamaldehyde (mol/mol) = 1:1, cinnamaldehyde (1 mmol), NaOH (0.5 g), H₂O (25 mL).

Note: column 3 should read conversion, not conversation

DOCUMENT 2: Possible mechanism



The possible mechanism of the alkaline hydrolysis of cinnamaldehyde catalyzed by 2-HP- β -CD.

DOCUMENT 3: General procedure for the alkaline hydrolysis of cinnamaldehyde to benzaldehyde

All reactions were performed in a 100mL glass reaction flask equipped with a condenser. In a typical experiment, cinnamaldehyde (1 mmol) was mixed with deionized water (25 mL), NaOH (0.5 g), and 2-HP- β -CD (1 mmol) at 323K while stirring. The reaction mixture was extracted by ethyl acetate and subsequently analyzed by GCeMS with naphthalene as an internal standard. The reproducibility for all the data was within 5%.

■ **Acquiring vocabulary**

English	French
conversion	
yield	
mechanism	
a glass flask	
ethyl acetate	

■ **Study of the synthesis**

Using the documents, identify the catalyst's simplified structure.

What type of bond does the catalyst first create with cinnamaldehyde?

Which temperature seems ideal for the synthesis? Explain.

■ **Going further...**

Explain what happens when ethyl acetate is added. Draw a diagram and explain orally.

Activity summary

What you must remember:

- Intermédiaires réactionnels
- Catalyseurs

Skills linked to the curriculum:

Compétences	Capacités à maîtriser
<ul style="list-style-type: none"> - ANA 	Identifier les facteurs permettant d'accélérer une réaction : changement de température, de concentration, utilisation d'un catalyseur. Nommer le type de réaction (acide-base, oxydation, réduction, addition, substitution, élimination). Comparer la stabilité des intermédiaires réactionnels (carbocation, carbanion et radical) pour interpréter la nature des produits obtenus et leur proportion relative, le mécanisme étant fourni Identifier le catalyseur et expliquer son rôle dans un mécanisme.
<ul style="list-style-type: none"> - COM 	Formuler et argumenter des réponses structurées Formuler et présenter une conclusion