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DECARBOXYLATION OF CYCLIC β-ENAMINOKETOESTERS WITH BORIC ACID

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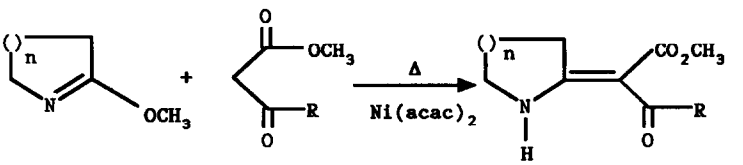
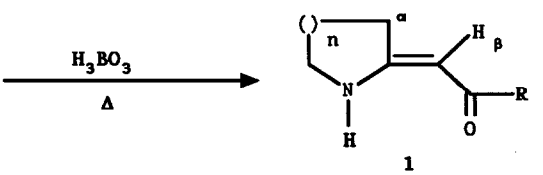
Summary : *Cyclic β-enaminoketoesters prepared by condensation between lactim ethers and β-ketoesters are decarboxylated without deacylation by thermolysis in presence of boric acid to lead stereospecifically to cyclic β-enaminones.*

Cyclic β-enaminones **1** are important building blocks for synthesis of natural products like ipalbine,[1] myrtine[2] or methylpelletierine.[3] These compounds are unstable and just a few of them have been isolated but often after transformation into β-enaminothioketones[4]. The general method mostly used for the preparation of cyclic β-enaminones involves a sulfur extrusion between a thiolactam and a α-halomethyl ketone as described by Eschenmoser & coll.[5] but this requires the preparation of such ketones. In connection with our research on the use of boric acid in heterocyclic synthesis, we describe a new stereospecific preparation of cyclic β-enaminones by decarboxylation of cyclic β-enaminoketoesters **2** which are directly prepared[6] by condensation between lactim ethers and β-ketoesters and can later be decarboxylated to compounds **1**.

Treatment of **2** with sodium alkoxide leads to a β-enaminoester by deacetylation;[4] drastic acidic media like trifluoroacetic acid[6] or hydrobromic acid[1] are not regiospecific and methanesulfonic acid[7] only gives deacylation, which led us to develop less acidic conditions using thermolysis with boric acid.





Heating (1 h, 220°C) **2** with excess solid boric acid leads, after work up (addition of methanol/hydrochloric acid 9/1 then water, neutralization with potassium carbonate, extraction with chloroform and purification), to exocyclic β-enaminones **1** with satisfactory

yields. This decarboxylation is stereospecific and the Z geometry of compounds 1 is unambiguously defined by the chemical shifts of the α-methylene protons, by comparison with the corresponding β-enaminoesters.[5]

Exocyclic β-enaminones 1

n	R	Yield%	Rf (Et_2O)	bp°C/mm Hg or mp°C/solvent	H_3BO_3 (eq.)	^{1}H-Nmr δ $CH_2\alpha$	δ CH β
1	CH_3	50	____	122/0.1[8]	2	2.55	5.10
1	C_3H_7	46	0.32	____[a]	8	2.58	5.07
1	C_6H_5	60	____	109/EtOH[9]	8	2.73	5.80
2	CH_3	43	____	98/0.1[10]	2	2.33	4.93
2	C_3H_7	30	0.44	____[a]	8	2.31	4.82
2	C_6H_5	50	0.51	____[a,10]	10	2.45	5.52
3	CH_3	39	____	110/0.05	2	2.37	4.95
3	C_3H_7	40	0.64	____[a]	8	2.23	4.88
3	C_6H_5	27	0.70	____[a,10]	10	2.45	5.65

[a] Oily products purified by column chromatography (silica gel).

This synthetic pathway provides a useful 3 steps stereospecific method for preparation of β-enaminones from very available starting materials.

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References

1. A. E. Wick, P. A. Barlett, and D. Dolphin, *Helv. Chim. Acta*, 1971, **54**, 513.
2. P. Slosse and C. Hootele, *Tetrahedron*, 1981, **37**, 4287.
3. V.W. Brown and B.P. Moore, *Australian J. Chem.*, 1982, **35**, 1255.
4. T. Yamazaki, K. Matoba, M. Yajima, M. Nagata, and R. N. Castle, *J. Heterocyclic Chem.*, 1975, **12**, 973.
5. M. Roth, P. Dubs, E. Götschi, and A. Eschenmoser, *Helv. Chim. Acta*, 1971, **54**, 710.
6. P. Brunerie, J.P. Célérier, H. Petit, and G. Lhommet, *J. Heterocyclic Chem.*, 1986, **23**, 1183.
7. G. Dannhardt, W. Meindl, S. Gussmann, S. Ajili, and T. Kappe, *Eur. J. Med. Chem.*, 1987, **22**, 505.
8. M. Natsume, M. Takahashi, K. Kiushi, and H. Sugaya, *Chem. Pharm. Bull.*, 1971, **19**, 2648.
9. W. Führer, V. Rasetti, and G. Rihs, *Helv. Chim. Acta*, 1985, **68**, 1235.
10. A. Ilvespaa and W. Führer, Ger. Pat. 2 707 658, 1975; *Chem. Abstr.* 1977, **88**, 22609z.

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