Chinese Chemical Letters Vol. 10, No. 9, pp. 727–728, 1999 727

Rearrangement of Hydrolysis Products of Tetrahydrofolate model compound

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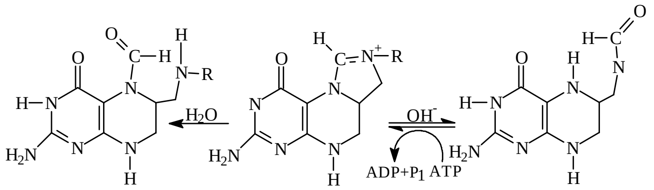
Abstract: The hydrolysis products of tetrahydrofolate model compound **4** were a mixture of **6** and **7** and the rearrangement reaction between **6** and **7** *via* **5** was in a state of equilibrium, confirmed by ^{1}HNMR and IR spectra.

Key words: Tetrahydrofolate, hydrolysis, rearrangement.

5,6,7,8-Tetrahydrofolate abbreviated THF is involved in the biological transfer of one-carbon fragment at different oxidation levels: formyl, formaldehyde, and methanol. When the transferable carbon is in formic acid oxidation level, the hydrolysis of THF **1** gives **2** and **3** respectively under different conditions[1].(See **Scheme 1**)

Scheme 1



2 **1** **3**

We have synthesized 1,2-dimethy-3-(*p*-methoxybenzenesulfonyl)imidazolinium iodide **4** as THF model compound at the formic acid oxidation level and reported its substituted one-carbon unit transfer reaction[2]. In order to reveal the hydrolysis mechanism of THF, the hydrolysis reaction of model compound **4** was studied in this paper.

Model compound **4** reacted with 5% NaOH in aqueous ethanol (1:1) to give the hydrolysis product.(See **Scheme 2**), of which the physical data was given in **Table 1**.

At first , the hydrolytic product was considered as a single compound observed by TLC until being confirmed by ^{1}HNMR, turning out to be the mixture of 6 and **7**(See **Table 2**).

Table 1 The physical data of the hydrolytic products

m.p.(℃)	yield(%)	colour	elemental analysis(found/cacld.)		
			C(%)	H(%)	N(%)
98.3-99.8	82	colorless	50.10(50.33)	6.09(6.34)	9.49(9.73)

In addition, the relative content of **6** and **7** determined by ^{1}HNMR changed in different deuterated agents for NMR, as shown in **Table 3**.

Scheme 2

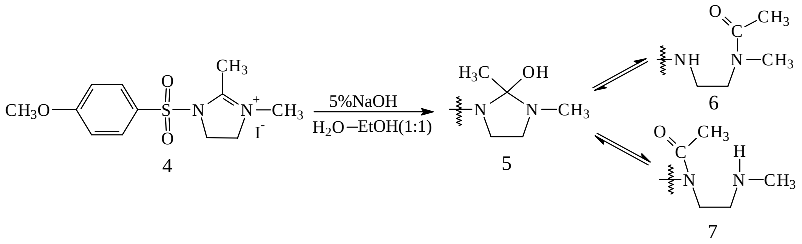


Table 2 The MS, IR and ^{1}HNMR data of the hydrolytic products

IR(KBr, cm^{-1})	MS(m/z, %)	^{1}HNMR(δ, ppm)	
		6	**7**
3435,3103(N-H) 1611(C=O) 1576(C=C) 1326,1158(S=O) 1265(O-C)	287(M$^+$,13) 115($C_5H_{11}N_2O^+$,60.5) 44($C_2H_5N^+$,100)	2.03(s,3H,CH_3CO) 2.95(s,3H,CH_3N) 3.10(m,2H,CH_2) 3.45(m,2H,CH_2) 3.86(s,3H,CH_3O) 5.78(m,1H,NH) 6.98-7.81(m,4H,C_6H_4)	2.12(s,3H,CH_3CO) 2.85(s,3H,CH_3N) 3.10(m,2H,CH_2) 3.45(m,2H,CH_2) 3.87(s,3H,CH_3O) 6.38(m,1H,NH) 6.98-7.81(m,4H,C_6H_4)

Table 3 The relative content of 6and 7 in different solvents(%)

No.	$CDCl_3$	DMSO-d_6	CD_3CN	CD_3COCD_3
6	75	56	67	65
7	25	44	33	35

Besides, it can be seen from IR data that there are characteristic absorption bands at 3435cm^{-1},3103cm^{-1} and 1611cm^{-1} by ν_{N-H}, $\nu_{C=O}$ respectively without strong ,wide and smooth absorption band at about 3300cm^{-1} by ν_{O-H}.

Furthermore, there was no change in the relative content of **6** and **7** when CF_3COOD was added to the hydrolysate solutions for ^{1}HNMR measurement.

From the results mentioned above, we think that compound **6** and **7** may be in a state of rearrangement equilibrium *via* **5** ,which can be indicated by **Scheme 2** ;that the intermediate **5** can not be determined when the hydrolysis reaction came to the equilibrium ; that the acid has no influence upon the hydrolysis reaction.

Acknowledgment

This work was supported by the National Natural Science Foundation of China and the Shanxi Provincial Foundation for the Returned Overseas Scientists.

References

1. M. I. Page, A. Williams, "*Enzyme Mechanisms*", The Royal Society of Chemistry Burlington House, London Wivobn, **1987**, 429.
2. J. X. Chen, J. G. Pan, C. Z. Xia and J. P. Cheng, *Acta Chimica Sinica*, **1998**, *56*, 819.

Received 2 April 1999