Tetrahedron Letters,Vol.25,No.51,pp 5951-5952,1984 0040-4039/84 $3.00+ .00
Printed in Great Britain

"A SIMPLE SYNTHESIS OF 2-METHYLIDENE-3-AMINOPROPANOATES"

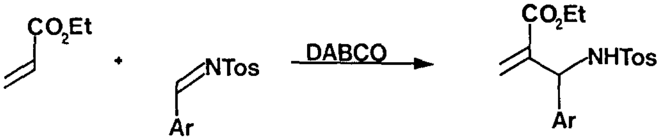
Patrick Perlmutter* and Chin Chin Teo
Chemistry Department, Monash University,
Clayton, Victoria, Australia 3168.

Coupling of ethyl acrylate to N-(para-toluenesulphonyl)imines of aromatic aldehydes is readily achieved using 1,4-diazabicyclo[2.2.2]octane as catalyst.

In 1972 Hillman and Baylis reported, in a patent, that acrylic acid derivatives could be coupled to a range of aldehydes in high yields using bicyclic tertiary amines as catalysts.[1]

Since then Drewes et al.[2] and Hoffmann et al.[3] have used this reaction as part of their syntheses of various necic acids. The first step in the catalytic cycle may well involve conjugate addition of the amine to the acrylate as we have found that the reaction fails for β-substituted acrylates.[4]

Although only aldehydes had been examined, it seemed possible that analogous systems, in particular, imines, might also participate in the reaction. The products would be of obvious value as precursors to β-lactams. To this end we have prepared several tosylimines of aromatic aldehydes[5] and found that they react well (see Table 1), under similar conditions to those used for aldehydes (eq. 1).[1,6]



(1)

A typical procedure is as follows: A mixture of ethyl acrylate (0.13 g, 1.3 mmol), N-(para-toluenesulphonyl)benzaldimine (0.34 g, 1.3 mmol) and 1,4-diazabicyclo[2.2.2]octane (15 mg, 0.13 mmol) was heated in a sealed tube at 80°C for 17 h. Residual ethyl acrylate was removed in vacuo. Chloroform (20 ml) was added and the solution was washed successively with 2M HCl (2 × 2 ml) and water (2 × 5 ml). The organic layer was dried over sodium sulphate, filtered and the solvent was removed in vacuo. The residue was purified by flash chromatography[7] on silica (eluant, ether-petroleum ether, 1:1) giving ethyl 2-methylidene-3-phenyl-3-(para-toluenesulphonyl)aminopropanoate as white needles, after recrystallisation from chloroform-petroleum ether, 0.38 g, 80%; m.p. 90-92°C. [Found: C 63.5, H 5.9, N 3.9. $C_{19}H_{21}NO_4S$ requires C 63.1, H 6.1, N 3.9%]. IR (ν_{max}) 3270, 1720 cm^{-1}. ^{1}H NMR (90 MHz) ($CDCl_3$) δ1.14 (t, *J* 7.1 Hz, 3H, $CH_2\underline{CH_3}$), 2.41 (s, 3H, CH_3), 4.05 (q, *J* 7.1 Hz, 2H, $\underline{CH_2}CH_3$), 5.30 (d, *J* 8.5 Hz, 1H, C3-H), 5.62 (d, *J* 8.5 Hz, 1H, NH), 5.79 (s, 1H, =CH), 6.21 (s, 1H, =CH), 7.23 (m, 7H), 7.68 (m, 2H). *m/e* (C.I.) 360 (M+1).

TABLE 1

Ar	Reaction Conditions	Yield (%)[a]
Phenyl	80°, 17h	80[b]
4-Methylphenyl	80°, 17h	73[b]
4-Methoxyphenyl	80°, 20h	70
3-Nitrophenyl	50°, 48h	53

[a] After purification by flash chromatography.[7]

[b] Purification by simple crystallization of the crude product was also possible but gave lower yields (~50%).

The scope of this reaction, with regard to both variation in the nature of the imine and acrylate, as well as ring closure of the products, is currently under investigation in our laboratories.

We thank Dr. R.F.C. Brown for helpful discussions and Mr. A.G. Barnes who attempted the first of these reactions. We also gratefully acknowledge financial assistance from the Monash University Special Research Fund.

1. A.B. Baylis and M.E. Hillman, German Patent 2155113 (May 1972) (Chem. Abstr., 1972, 77, 34174q).
2. S.E. Drewes and N.D. Emslie, J. Chem. Soc. Perkin Trans. 1, 1982, 2079.
3. H.M.R. Hoffmann and J. Rabe, Angew. Chem. Int. Ed. Engl., 1983, 22, 795.
4. C.C. Teo, unpublished results.
5. A.E. Kretov and E.A. Abrazhanova, Russ. J. Gen. Chem. (in English), 1957, 27, 2051.
6. All new compounds gave satisfactory spectra and elemental analyses.
7. W.C. Still, M. Kahn and A. Mitra, J. Org. Chem., 1978, 43, 2923.

(Received in UK 1 October 1984)