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A LINEAR FREE ENERGY CORRELATION BETWEEN SOLVENT PARAMETER $E_T(30)$ AND STEREOSELECTIVITY IN THE CONDENSATION OF PHENYLMAGNESIUM BROMIDE WITH (±)-3-PHENYLBUTANONE.

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SUMMARY.- A direct influence of the solvent on the RS,SR/RR,SS ratio in nucleophilic additions of phenylmagnesium bromide to (±)-3-phenylbutanone is reported.

An unexpected linear correlation between the stereoselectivity and the $E_T(30)$(1) parameter of the solvent in the condensation between phenylmagnesium bromide and (±)-3-phenylbutanone in differents solvents at 30° has been found.

Relevant data for this correlation are collected in Table 1. Seven solvents with a variation range of 33-39 E_T unities have been used. In none of the cases dehydration products were detected in the analysis conditions used(2). Besides the carbinols, the only products detected were biphenyl, formed as usual from PhMgBr, and, when triethylamine was used as solvent, the original ketone. In this case an enolization reaction seems to be responsible for the low conversion. Attempt to use HMPT as solvent yielded a conversion of ~5%. Caracterization of the diastereomeric carbinols has been carried out by comparison with authentic samples(3).

TABLE 1. $E_T(30)$ values and stereoselectivity observed (ln RS,SR/RR,SS) in the condensation of (±)-3-phenylbutanone with phenylmagnesium bromide at 30°.

Solvent	Diglyme[a]	DME[b]	THF[b]	1,4-dioxane[c]	Et_2O[b]	Pr^i_2O[b]	Et_3N[d]
$E_T(30)$	38.9	38.6	37.4	36.2	34.6	34.0	33.3
$\ln \frac{RS,SR}{RR,SS}$	+0.663	+0.995	+0.447	-0.040	-0.575	-0.800	-1.046

a) Yield: 92%. b) Yield: >98%. c) Yield: 91%. d) Yield: 20%.

The linear correlation between the ln RS,SR/RR,SS and the $E_T(30)$ parameters of the solvents is satisfactory in the range here considered (σ = 0.51 . r = 0.986).

The operative conditions have been the same in all cases. 8 ml. of a 0.25 M phenylmagnesium bromide ether solution and a excess of the solvent used in each case were concentrated in vacuum up to final volume of 5 ml. This process is repeated four times to make sure that the change of solvent has been complete(4). Keeping the solution at a constant temperature of 30°, 50 mg. of the carbonyl compound are then added through a septum and the mixture is stirred for 8 h. All steps were carried out in the absence of oxygene and moisture.

It can be observed that the RS,SR/RR,SS product ratio increases as the solvent polarity becomes greater. Although stereoselectivity seems to be mainly dependent on steric contributions(5) dependence of it with solvent at least in the particular case here reported, must neccesarily be related to polar differentiating factors. In this case, it can be assumed that this dependence might be due to the more dipolar and hence more strongly solvated activated complex leading to the RS,SR product.

The relative stabilization of $TS^{\neq}$ giving rise to the carbinol RS,SR *vs*. $TS^{\neq}$ leading to the carbinol RR,SS is now studied by the introduction of polar substituents in *m* and *p* positions of the ring in α position to the carbonyl group, and by the use of arylic Grignard reagents with different substituents in the ring. Likewise, studies are being carried out in order to extend these results to other acyclic carbonyl compounds.

Notes and references.

(1) K. Dimroth, C. Reichardt, T. Siepmann and F. Bohlmann, *Liebigs Ann. Chem.*, 661,1(1963); K. Dimroth and C. Reichardt, *Ibid.*,727,93(1969);C. Reichardt,*Ibid.*,752,64(1971).

(2) The RS,SR/RR,SS ratios were evaluated by GLC using a column of Apiezon 15% on Chromosorb G-AW DMCS (length 2 m.; column temperature 160°). Retention times: carbinol RR,SS 80 min.; carbinol RS,SR 88 min.

(3) R. Pérez-Ossorio, A. Pérez-Rubalcaba and M.L. Quiroga (in press).

(4) The stereochemical results were the same when the Grignard reagent was prepared directly in the solvent used or when it wan obtained by redissolving a sample of phenylmagnesium bromide prepared in ether and evaporated to dryness.

(5) E.C. Ashby and J. Laemle, *Chem. Rev.*,75,521(1975).

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