

A NEW, SIMPLE, STEREOSELECTIVE METHOD FOR ANGULAR METHYLATION

Anthony J. Sisti and Americus C. Vitale

Department of Chemistry, Adelphi University Garden City, New York

(Received in USA 22 April 1969; received in UK for publication 8 May 1969)

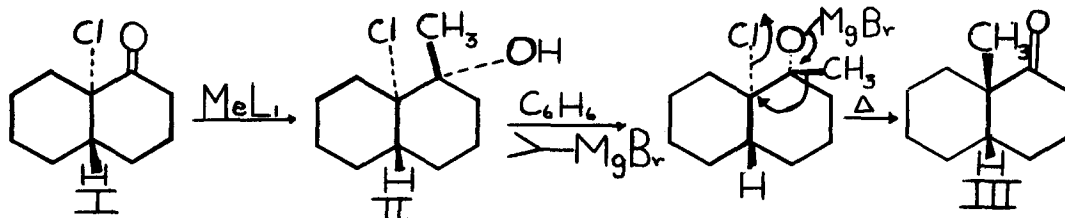
The rearrangement of the magnesium salts of halohydrins to ketones has long been known (1). Its application to the synthesis of  $\alpha$ -alkyl- and  $\alpha$ -aryl-substituted ketones has also been well established (1). More recently, (2) the reaction has offered a simple, new procedure for ring enlargement. Geissman and Akawie (1) have convincingly demonstrated that for the rearrangement to occur the hydroxyl and halo groups must be cis. We wish to report the first application of the aforementioned reaction for a stereoselective introduction of an angular methyl group into trans-1-decalone.

Trans-1-decalone was treated with sulfonyl chloride to yield a mixture of cis- and trans-9-chloro-1-decalone, from which, by a previously described procedure (3), trans-9-chloro-1-decalone (I) was isolated. The latter (75 ml ether) (0.03 molè) was treated dropwise with methyl lithium at dry-ice acetone temperature after which the mixture was stirred for 1 1/2 hrs at dry-ice temperature and then for 2 hrs at  $-5^{\circ}$ . After workup with ammonium chloride, the halohydrin\* , (II), gave an nmr, ( $\text{CCl}_4$ )  $\tau$  8.72 (singlet, methyl group), ir, (film)  $3350 \text{ cm}^{-1}$  and  $3460 \text{ cm}^{-1}$  (hydroxyl group) and an instantaneous precipitate with alcoholic silver nitrate. The halohydrin undoubtedly possesses the indicated stereochemistry since the organo lithium should approach opposite the chloro group. Thus, the prescribed stereochemistry for the rearrangement was established (-OH and Cl, cis). An equivalent amount of isopropyl magnesium bromide

---

\*Various attempts to purify the halohydrin were fruitless probably due to the lability of the tertiary chloro group.

(ether) (assumed a 100% conversion of I to II) was then added dropwise to a cooled benzene (100 ml) solution of the crude halohydrin. After the addition, the solution was refluxed for 2 hrs, followed by decomposition with ammonium chloride. Distillation (spinning band column) of the residue yielded 2.9 g, (58%) b. p. 50-52° / 0.3 mm (Lit. (4) b. p. 100° / 7-8 mm) of cis-9-methyl-1-decalone (III). The latter was identified by vpc (TCEP 4' column, 175°) and ir,



each of which gave a perfect comparison with an authentic sample\*\*. Vpc also indicated the absence of the trans isomer, however, a minor (5%) contaminant was indicated, its structure is presently under investigation. In addition further evidence for III was attained from the 2,4-dinitrophenylhydrazone, m. p. 163-164° (Lit. (4) m. p. 164-165°) and the oxime, m. p. 109-110° (Lit. (4) m. p. 109-110°).

The reported method for the stereoselective angular methylation obviously requires further applications, these are presently being planned.

#### References

- 1) M. Tiffeneau and B. Tchoubar, Compt. rend. 198, 941 (1934); T. A. Geissman and R. I. Akawie, J. Amer. Chem. Soc., 73, 1993 (1951); A. S. Hussey and R. R. Herr, J. Org. Chem., 24, 843 (1959).
- 2) A. J. Sisti, Tetrahedron Letters, 5327 (1967); A. J. Sisti, J. Org. Chem., 33, 453 (1968); A. J. Sisti, J. Org. Chem., 33, 3953 (1968).
- 3) H. O. House and G. A. Frank, J. Org. Chem., 30, 2953 (1965).
- 4) W. S. Johnson, J. Amer. Chem. Soc., 65, 1317 (1943).

---

\*\*We are grateful to Dr. W. S. Johnson for a sample containing 85% cis- and 15% trans-9-methyl-1-decalone.