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# OPTICAL ROTATORY DISPERSION STUDIES CXXI.[1] VERIFICATION OF THE ABSOLUTE CONFIGURATION OF 2-METHYLCYCLOHEXANONE

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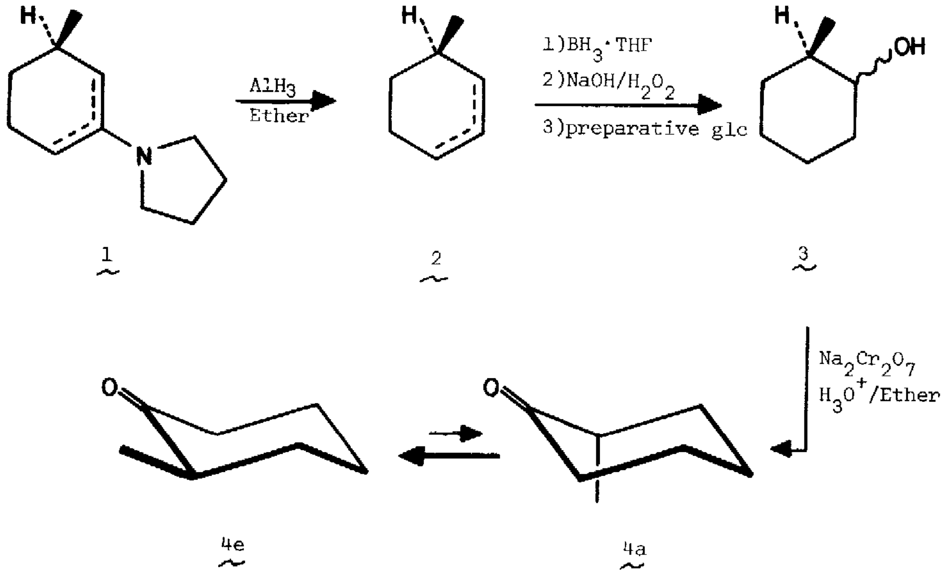
Since its establishment as a rational basis for the Cotton effects of saturated ketones, the octant rule[3] has been applied with great success to a wide variety of stereochemical and configurational problems.[4] Because this rule correlates the immediate stereochemical environment of a dissymmetrically perturbed carbonyl group to the sign of its Cotton effect, it has become an important method in the determination of absolute configuration of saturated ketones.

Conformational analysis requires that 2-methylcyclohexanone exist chiefly as an equilibrium mixture of axial (4a) and equatorial (4e) chair conformers with the more stable 4e predominant. Considerable experimental evidence[5] suggests that equatorial substituents make a negligible contribution to the Cotton effect, and are thus overwhelmed by the large rotatory contribution of the minor axial conformer. The negligible contribution of α-equatorial substituents has received theoretical support from a number of authors[6] but has been seriously questioned by results of semi-empirical and ab initio calculations by Rauk, et al.[7] Despite substantial scatter in computed rotatory strengths these authors assert that the equatorial isomer of (R)-2-methylcyclohexanone (4e) is predicted to exhibit an unexpectedly large positive rotation, and thus suggest that the previously assigned[8] absolute configuration based on the octant rule is in error. Since this assertion raises serious fundamental questions, it seemed imperative to unambiguously verify this assignment.

Reduction of the pyrrolidine enamine (1) of (R)-3-methylcyclohexanone[9] with AlH$_3$[10] led to a mixture of (R)-3-, and (R)-4-methylcyclohexene (2)[11] which was not separated but subjected to hydroboration-oxidation[12] directly to provide a mixture of 2-, 3- and 4-methylcyclohexanols,[11] from which pure 2-methylcyclohexanol (3) could be separated by preparative glc (15% Carbowax 4000 on Chromosorb A, 130°). Two-phase oxidation[13] afforded (R)(-)-2-methylcyclohexanone (4) (free of residual 3 by glc). The circular dichroism curve was negative, $[\theta]^{max}_{288nm} = -987°$ (c = 0.54% in MeOH). Upon addition of base the cd slowly decreased to baseline, thus excluding the possibility of contamination of 4 by (R)-3-methylcyclohexanone.

The negative cd of 4 reconfirms the initial[8] assignment of absolute configuration to this molecule as well as the absolute configurational assignments[8] of the isomeric 2-methylcyclohexanols, all of which have been related to 4.



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