

# The Absolute Configuration of Pulegoneoxide

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Reusch and Johnson<sup>1)</sup> recently reported on the configuration of diastereomeric pulegoneoxides and deduced that the (–)-pulegoneoxide which was derived from (+)-pulegone should be assigned the *cis* structure, and the (+)-pulegoneoxide, the *trans* structure, on the basis of IR, UV, NMR, and ORD data.

In contrast to the above deduction, Djerassi et al.<sup>2)</sup> suggested that the assignment should be reversed in the light of his ORD investigations. The present paper will attempt to establish the absolute configuration of these pulegoneoxides by means of unequivocal chemical transformations of these oxides into diols with well-defined configurations.

(+)-(1*R*)-Pulegone (I) was oxidized with 30% hydrogen peroxide in a 30% sodium hydroxide

solution to give a mixture of *cis*- and *trans*-pulegone-oxide, m. p. 43°C.

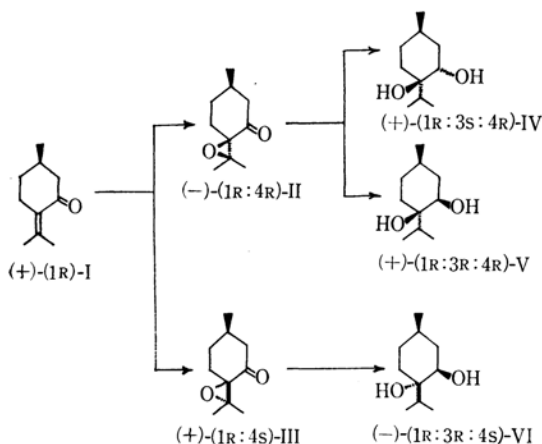
The fractional distillation, followed by the zone-melting purification, of the mixture afforded (–)-pulegoneoxide (II), m. p. 54°C,  $[\alpha]_D^{20} -18.8^\circ$  (ethanol), and (+)-*cis*-pulegoneoxide (III), m. p. 59°C;  $[\alpha]_D^{20} +46.6^\circ$  (methanol).

The (–)-diastereomer (II) was then reduced with lithium aluminum hydride in ether to give (+)-*trans*-4-hydroxyneomenthol (IV) in an 83% yield, m. p. 72°C;  $[\alpha]_D^{20} +22.6^\circ$  (chloroform), and (+)-*cis*-4-hydroxymenthol (V) in a 17% yield, m. p. 76°C;  $[\alpha]_D^{20} +10.4^\circ$  (chloroform).

These diols (IV and V) were identified as such by an IR-comparison with authentic (+)-(1*R*:3*S*:4*R*)-*trans*-4-hydroxyneomenthol<sup>3)</sup> and (+)-(1*R*:3*R*:4*R*)-*cis*-4-hydroxymenthol<sup>4)</sup> respectively.

The diastereomeric (+)-pulegoneoxide (III) was reduced with lithium aluminum hydride to give (–)-*trans*-4-hydroxyneoisomenthol (VI) in an almost quantitative yield, m. p. 76°C,  $[\alpha]_D^{20} -22.0$  (methanol). This was identified by a melting-point determination and by an IR comparison with authentic (–)-(1*R*:3*R*:4*S*)-*trans*-4-hydroxy-neoisomenthol.<sup>4)</sup>

The results in the present study unambiguously settle the dispute about the absolute configuration of pulegoneoxides and support Djerassi et al.'s assignment based on the ORD investigations. The observed negative and positive Cotton effects of (–)-II and (+)-III respectively also suggest the reasonable applicability of the "reversed" Octant rule<sup>2)</sup> to spiro [5, 2] systems. Further details will be reported elsewhere in the near future.



1) W. Reusch and C. K. Johnson, *J. Org. Chem.*, **28**, 2557 (1963).

2) C. Djerassi, W. Klyne, T. Norin, G. Ohloff and E. Klein, *Tetrahedron*, **21**, 163 (1965).

3) T. Suga, T. Shishibori and T. Matsuura, *This Bulletin*, **37**, 310 (1964).

4) W. Tagaki and T. Mitsui, *J. Org. Chem.*, **25**, 1476 (1960).