

The advantage of this form of compensator is that the plates can be made from almost any birefringent material whatsoever, since the orientation of the optic axis or axes does not affect the mutual neutralization for normal transmission. The present optical element consists of two plates of selenite of 2.5 mm. thickness, giving a compensating range of about four wave-lengths; but mica would probably be preferable because it would permit of thinner plates. In the case of the most common form of mica, the normal bisects the acute angle of the optic axes, so that a pair of opposed mica plates have to be tilted through only a comparatively small angle to bring an optic axis of one of them into coincidence with the direction of transmission. When one of the mica plates is in this particular position, its retarding effect is zero, while that of the other will be rather greater than for normal transmission. Consequently, if each mica plate is of such thickness as to introduce a retardation of, say, four wave-lengths, a total retardation exceeding this value will be obtained when the plates are combined in opposition and tilted into the above position.

The calibration may be computed along the lines mentioned by F. Record¹, with the difference that there are two plates to be computed separately, each pair of values corresponding to a given angle of inclination being afterwards added to provide the calibration curve.

Mounting the two plates separately in such a manner that they can be tilted independently of one another suggests further possibilities which might be worth investigating.

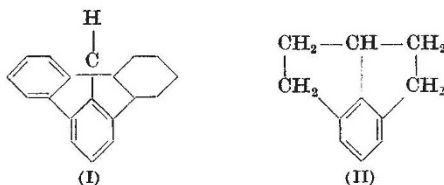
F. HUGHES SMITH

30 West Park Avenue,
Newby, Nr. Scarborough.
Sept. 24.

¹ *Nature*, 162, 454 (1948).

I : 9-cycloHexylenefluorene

Hurd and Mold¹ have recently described the dehydration of 2-fluorenylcyclohexanol to a saturated hydrocarbon to which they attribute the structure (I) of 1 : 9-cyclohexylenefluorene. If this structure were correct, the result would be of considerable importance, for it would represent the first successful attempt to prepare a compound having the highly strained ring-system (II) which von Eraun had completely failed to obtain².



It is very unlikely, however, that the hydrocarbon of Hurd and Mold has the structure (I). The dehydration of their carbinol is probably analogous to that of 2-benzylcyclohexanol, which gives a bridged ring hydrocarbon³. Experiments to test this hypothesis are being initiated.

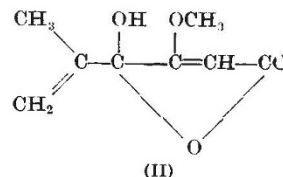
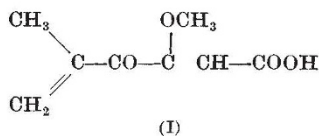
J. W. COOK

University of Glasgow.
Sept. 18.

¹ Hurd, C. D., and Mold, J. D., *J. Org. Chem.*, 13, 339 (1948).² See Johnson, W. S., "Organic Reactions", 2, 124.³ Cook, J. W., and Hewett, C. L., *J. Chem. Soc.*, 62 (1936).

Tautomerism of Penicillic Acid

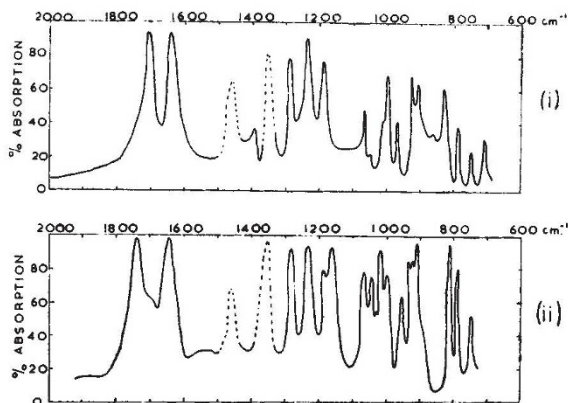
THE existence of tautomeric forms of penicillic acid was first postulated by Birkinshaw, Oxford and Raistrick¹. Recent workers have tended to the view that the hypothesis of tautomerism was not needed to explain the chemical properties of penicillic acid².



However, the infra-red spectra of penicillic acid furnish conclusive evidence for the existence, in the solid phase at least, of two tautomeric forms. The infra-red spectra of the two forms are shown in Figs. (i) and (ii). Spectrum (i), with carbonyl absorption band at 1,714 cm.⁻¹, is that of the keto acid (I); and spectrum (ii), with carbonyl absorption band at 1,738 cm.⁻¹, is that of the lactone form (II). Key bands for each form are :

Keto acid	1,714	1,393	967	831			cm. ⁻¹
Lactone	1,738	1,165	1,032w	956	935	808	cm. ⁻¹

The infra-red spectrum of the sodium salt of penicillic acid has been obtained. This contained no lactone carbonyl absorption band, but a powerful new band at 1,550 cm.⁻¹ was observed, indicating the formation of a carboxyl ion. It was concluded that the sodium salt was the salt of the keto acid and not an enolic salt.



The two forms of penicillic acid can be readily interconverted. The lactone form was produced by melting the keto acid and allowing it to crystallize. It was also formed by prolonged grinding of the keto acid in 'Nujol'. When the lactone form was dissolved in ether and recrystallized, the keto acid was again produced. By suitable physical treatment, all types of mixture from 100 per cent form I to 100 per cent form II can be obtained.

A number of analogues of penicillic acid have been examined; but no further examples of tautomerism have been observed.