or free glutamic acid. The Trp recovered after deprotection and elimination of the Mesna® has exactly the same spectrum as free Trp.

As the cleavage rates were very high, we tried an experiment using more dilute solutions and a lower molar excess of Mesna®. BOC Ala dissolved in glacial acetic acid was cleaved with a 7 or 3.5 molar excess of Mesna®.

In the first case, splitting off of the BOC group was almost complete after a reaction time of 2 min and was fully achieved after 5 min. In the second trial, the cleavage was not complete after 5 min but was effected after 10 min.

This reagent being very effective when both products are in solution, we decided to try it in the solid phase peptide synthesis.

A first trial was made with a polymer bearing 0.4 mmoles of BOC Gly/g; we used a 7-fold molar excess of Mesna® (20% solution in glacial acetic acid) and a reaction time of 30 min.

The free amino groups were detected by a modification of the procedure of DORMAN[5,6]. The cleavage of the BOC group was quantitative, using these conditions. As this reagent is safe, easy to handle and does not destroy Trp, this procedure is routinely used in our laboratory in the solid phase synthesis of peptides up to 25 amino-acids[7].

Résumé. L'acide mercapto éthane sulfonique est utilisé pour déprotéger la fonction amine des t-butyloxycarbonyl acides aminés. La réaction, extrêmement rapide en phase homogène, a été appliquée à la synthèse de peptides en phase solide.

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Application of a Shift Reagent in Nuclear Magnetic Resonance Spectroscopy of Esters. An Approach for Simple Identification and Simultaneous Determination of Tocopherols

The use of *tris*(dipivalomethanato)europium as a dramatic shift reagent in NMR was reported by HINCKLEY[1] and SANDERS et al.[2] and several applications of this reagent in organic chemistry have been described in succession[3]. The usefulness of this reagent in the 60 MHz apparatus for structural determination of polyene esters (and ether) was also verified by the present authors for normal- and retro-vitamin A derivatives[4]. In our case, only extremely weak or no co-ordination between this reagent and conjugated carbon-carbon double bond was observed. We now report a further example in which methyl groups attached on the benzene moiety of tocopheryl acetates can be assigned confidently by using this reagent, and we propose simultaneous determination of tocopherols together with their identification by recording a NMR-spectrum of the acetates mixture.

Table I. Chemical shifts (ν)[a] and relative paramagnetic shifts ($\Delta\nu$)[b] of tocopheryl acetates

H	α		γ		δ	
	ν (cps)	$\Delta\nu$	ν	$\Delta\nu$	ν	$\Delta\nu$
6-OAc	132.8	100.0	130.6	100.0	128.9	100.0
5-Me	114.9	58.2				
7-Me	117.7	57.6	118.2	53.8		
8-Me	123.4	13.1	124.7	11.6	127.5	5.2

[a] Measured from running of the carbon tetrachloride solution of the acetate on the Varian A 60-D (60 MHz) instrument, tetramethylsilane being used as an internal standard. The second oxygen on the dihydropyran ring has little indication of co-ordination to the shift reagent under the experimental conditions (molar ratio of the reagent to the acetate = 1 — 2:3.8). [b] Shift value of the acetyl group = 100.0.

As aryl methyls in tocopherols have been known to have similar chemical shift values and practically only a single peak was observed on a conventional NMR running[5], it is for this reason that another approach for a definite characterizing of tocopherols in various binary systems was discussed[6]. Our own finding now indicates that the differentially recognizable peaks of these aryl methyls do appear simply by converting the parent phe-

Table II. Relative paramagnetic shifts ($\Delta\nu$)[a] of hydrogens and methyls on the phenol acetate moiety

H	$\Delta\nu$
o-H	70 ± 8
o-Me	56 ± 3
m-H	27 ± 5
m-Me	5–13
p-Me	ca. 5

[a] Surveyed from the results on cresyl and tocopheryl acetates using a shift reagent $Eu(DPM)_3$. Shift value of the acetyl group = 100.0.

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nolic compounds into their acetates, the chemical shift of each methyl group being determined by using the shift reagent described above (Table I). From the experimental results obtained on cresyl acetates (*o*, *m*, and *p*) and tocopheryl acetates (α, γ, and δ), paramagnetic shifts of hydrogens and methyls located on the benzene ring of phenol acetate are surveyed in Table II. It is apparent that pseudocontact origin is generally dominant, though some other interaction is also involved in the case of the methyl groupings of this series. It is possible to estimate a molar ratio or each content of tocopheryl acetates in mixture by simple measurement of a height ratio of the respective acetyl peaks or of peak areas attributable to aryl methyls, if necessary. Further details will be given elsewhere[7].

Zusammenfassung. Methode zur genaueren Identifizierung von Phenolacetaten wie Kresyl- bzw. Tocopheryl-Acetaten durch NMR mit Shift-Reagenz $Eu(DPM)_3$ und gleichzeitiger Gehaltsbestimmung der Tocopherole in der Mischung.

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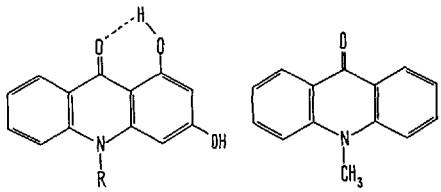
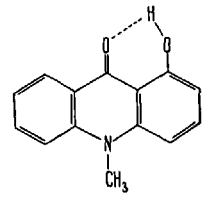
1-Hydroxy-N-methylacridon, ein ungewöhnlich substituiertes Acridin-Alkaloid aus *Ruta graveolens*[1]

Acridin-Alkaloide sind seit etwa zwanzig Jahren als Inhaltsstoffe der Rutaceen bekannt[2,3]. Ihre Biosynthese verläuft nach bisherigen Kenntnissen aus Anthranilsäure und drei Acetat-Einheiten zum 1,3-Dihydroxy-acridon *1*[4]. Aus dieser Schlüsselsubstanz waren – bis auf eine Ausnahme – alle bisher aufgefundenen Alkaloide dieses Typs, durch zusätzliche Kernhydroxylierungen, Methoxylierungen sowie Einbau isoprenoider Bauelemente, formal ableitbar.

Die Bildung des N-Methylacridons *2*, welches von Dreyer[5] aus Thamnosma Torr. und Frem. isoliert werden konnte, ist dagegen nur durch reduktive Entfernung der beiden OH-Gruppen in *1* erklärbar.



1 R=H oder CH_3 **2**



3

Aus dem Petrolätherextrakt der Wurzeln von *Ruta graveolens* lässt sich säulenchromatographisch (Adsorbens: SiO_2, 0.2–0.5 mm Merck, Elution: Benzol/Äthylacetat 8:2) ein bisher unbekannter Inhaltsstoff (Schmp. 192–194°) gewinnen, der aufgrund seiner spektralen Eigenschaften[6,7] ein Acridon-Abkömmling sein muss. Durch die Summenformel $C_{14}H_{11}NO_2$ (m.s.), die dunkelgrüne $FeCl_3$-Reaktion[6,8] sowie das 1H-Singulett bei $\delta = 14.5$ ppm (*peri*-OH) und das 3H-Singulett bei $\delta = 3.8$ ppm ($>N-CH_3$) ergab sich für das Alkaloid die Struktur *3*. UV- und Massen-Spektren entsprechen den Literatur-Angaben[9,10]. Weiterhin konnte die Struktur durch Vergleich mit authentischem Material identifiziert werden[11]. Extraktionsmethode und fluoreszenzmikroskopische Lokalisierung im Gewebe sichern[12] das genuine Vorkommen des 1-Hydroxy-N-methylacridons in der Pflanze.

Résumé. A partir des racines de *Ruta graveolens*, on a isolé un alcaloide acridonique, 1-hydroxy-N-méthyl-acridone, dont la biosynthèse doit comporter une élimination réductive des OH-groups en C-1 et C-3.

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