Note on Ultraviolet Spectra of Some Amino Acids and Their Derivatives

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It is well known that differences exist in the ultraviolet spectra of *cis* and *trans* isomers. From Mulliken's theoretical studies on electronic transitions in polyatomic molecules[2] it is known that, for equal molecules, a greater elongation of the molecule causes stronger absorption; the stronger absorption of *trans* isomers[3] could be explained in this way[4].

By condensation of N-phthaloyl acetaldehyde with malonic acid, Balenović, Jambrešić and Urbas[1] obtained two isomeric γ-phthalimidocrotonic acids with the m.p.s. 179° and 218° respectively. Catalytic hydrogenation of both compounds gave γ-phthalimidobutyric acid, indicating *cis-trans* stereoisomerism.

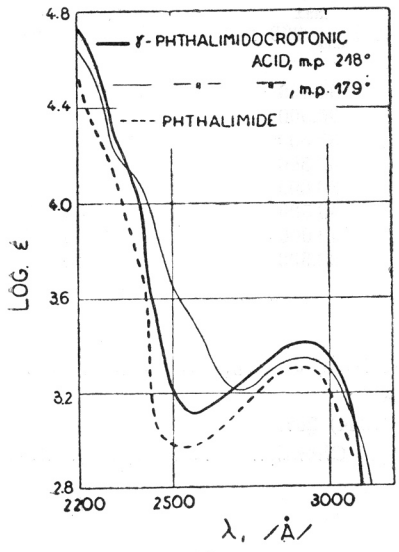

Fig. 1

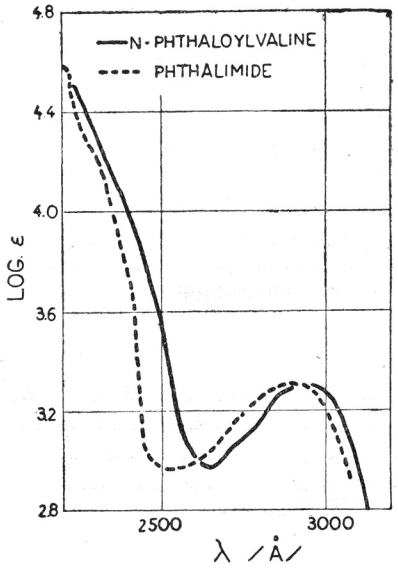

Fig. 2

γ-Phthalimidocrotonic acid of the m. p. 218° has λ_{max} 220 mμ, 295 mμ; ε_{max} 53.000, 2.650. γ-Phthalimidocrotonic acid of the m. p. 179° has λ_{max} 220 mμ, 295 mμ; ε_{max} 42.000, 2.150 (Fig. 1). Judging from these experimental data, it can be assumed that the compound with the m. p. 218° is the *trans* isomer.

The measurement of the absorption spectra of some N-phthaloyl substituted amino acids were also performed; the results are summarized in Table I and Fig. 2. The following compounds were investigated: phthalimide, N-phthaloyl glycine, N-phthaloyl valine, γ-phthalimidobutyric acid, N-phthaloyl-O-ethyl serine, γ-phthalimidobutyryl glycine, α-phthalimidopropionaldehyde and phthalimidoacetone. The absorption spectra of these compounds do not differ much one from another, owing to the influence of the aromatic chromofore.

The great influence of the aromatic chromofore could also be responsible for the very small differences in λ_{max} of *cis* and *trans* γ-phthalimidocrotonic acids; greater differences of λ_{max} of *cis* and *trans* isomers have been described in several cases[4].

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EXPERIMENTAL

Purification of compounds. The compounds used were prepared in the Chemical Institute[1] and recrystallized from 96% ethanol.

Preparation of solutions. The weighed samples were dissolved in aldehyde-free 96% ethanol.

Measurement of the absorption spectra in the ultra-violet. The absorption spectra were determined by means of a Beckman quarz spectrophotometer, model DU.

TABLE I

Compound	ε_{max} for λ_{max} 220 mμ	ε_{max} for λ_{max} 290 mμ
Phthalimide	34.500	2.200
N-Phthaloyl glycine	36.500	1.200
N-Phthaloyl valine	33.500	1.900
γ-Phthalimidobutyric acid	43.500	2.200
N-Phthaloyl-O-ethyl serine	36.000	2.000
γ-Phthalimidobutyryl glycine	46.500	2.500
α-Phthalimidopropionaldehyde	40.000	2.100
Phthalimidoacetone	38.500	1.900

REFERENCES

1. K. Balenović, I. Jambrešić and B. Urbas, *J. Org. Chem.* (in press).
2. R. S. Mulliken, *J. Chem. Phys.* **7** (1939) 364.
3. cf. e. g. L. Zechmeister, *Chem. Revs.* **34** (1944) 267.
4. cf. e. g. F. A. Miller in H. Gilman, *Organic Chemistry*, Vol. III, New York, 1953, page 168.

IZVOD

Bilješka o ultravioletnim spektrima nekih aminokiselina i njihovih derivata

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Izmjereni su ultravioletni apsorpcioni spektri ovih aminokiselina i njihovih derivata: ftalimida, N-ftaloilglicina, N-ftaloilvalina, γ-ftalimidomaslačne kiseline, N-ftaloil-O-etilserina, γ-ftalimidobutirilglicina, α-ftalimidopropionaldehida, te γ-ftalimidokrotonske kiseline sa t. t. 218°, γ-ftalimidokrotonske kiseline sa t. t. 179°.

Prema dobro poznatim pravilnostima, koje se pojavljuju kod apsorpcionih spektara *cis* i *trans* izomera, zaključeno je, da je γ-ftalimidokrotonska kiselina sa t. t. 218° *trans* izomer.

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