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The Condensation Products of Saccharin with some Aromatic Amines III

Sakarinin Bazı Aromatik Aminlerle Verdiği Kondansasyon Bileşikleri III

Hüsamettin KUTLU *

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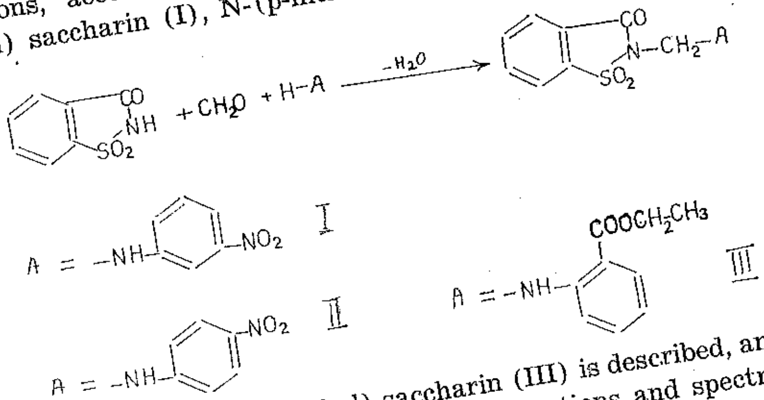

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* Farmasötik Kimya Kürsüsü, Eczacılık Fakültesi, Üniversite, İstanbul.

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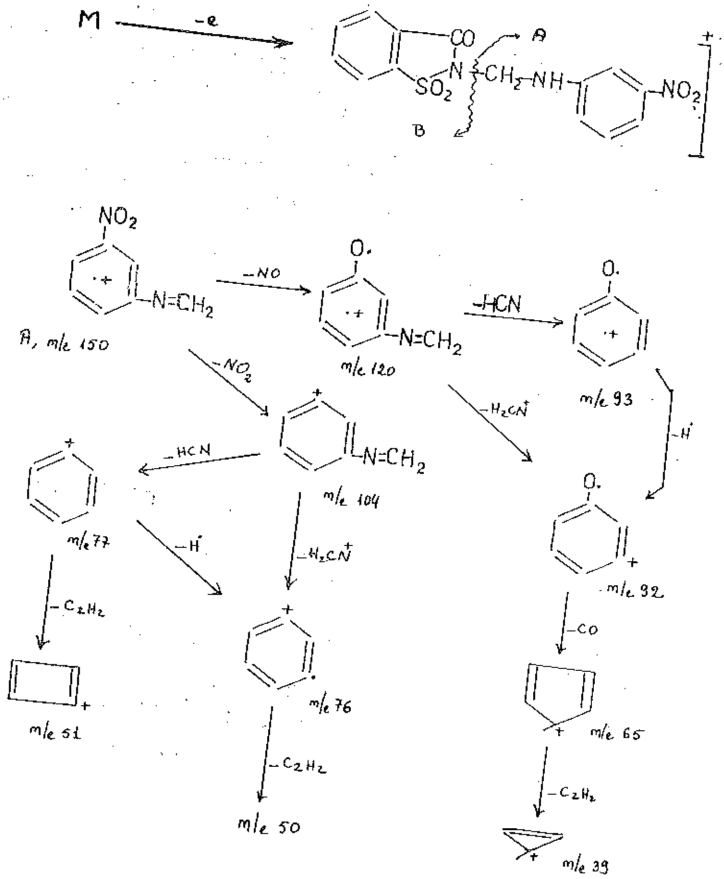

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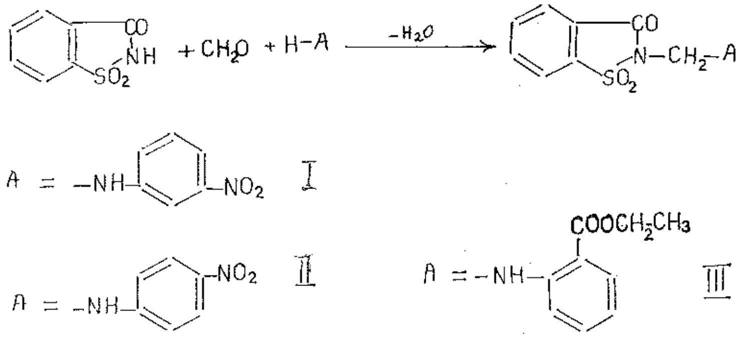

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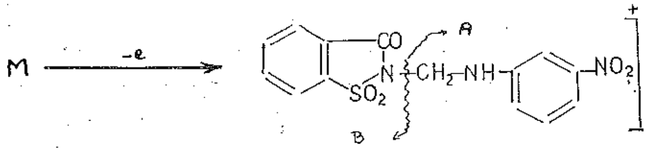
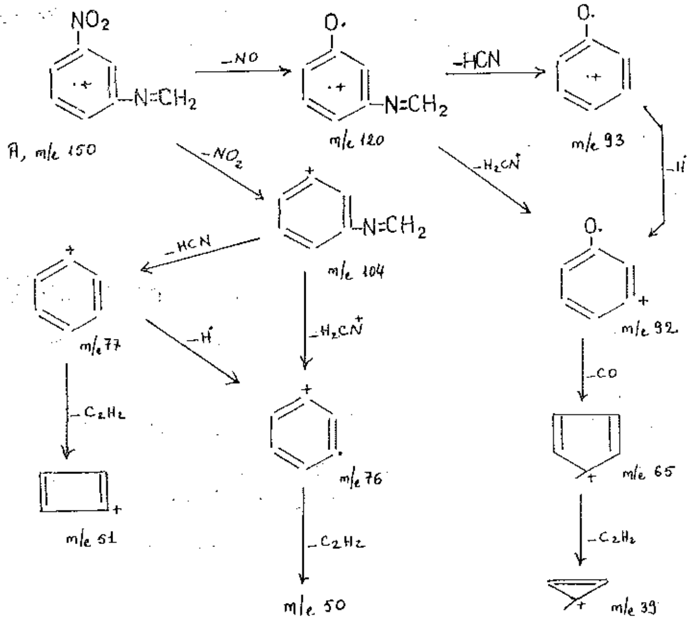
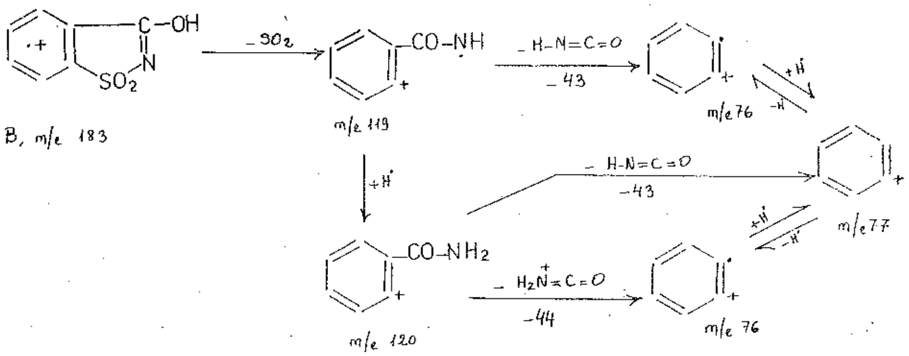
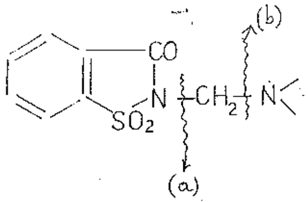






From these results one can find, the all three starting materials (formaldehyde, imide and amine) are in the structure of these substances and it is possible to claim that the imide C-N bond (a) is weaker than the amine C-N (b) (3). In addition, elementary analysis agreed with the expected formulas.



EXPERİMENTAL

General method for preparation. A mixture of 18.0 g (0.1 mol) of saccharin and 10 g (about 0.33 mol) of paraformaldehyde in 200 ml ethanol was refluxed on a water-bath until clear solution, then a solution or suspension of 0.1 mol g of amine in ethanol was added to this hot solution, and reheated for a required period of time for each substance. At the end of this time, ethanol was decanted, the residue was treated first with ammonia (10 % solution) or with aceton, then a small amount of ethanol and finally with a suitable solvent to dissolve the unreacted amine. The substances thus prepared were subjected to the following tests:

I) Chromatography. Substances were dissolved in a minimum amount of an appropriate solvent and were developed on 10 x 20 cm silica gel G plates with benzen, chloroform, aceton, methanol or with benzen-methanol mixtures in different proportions. Chromatograms allowed to dry in air and the spots were revealed either by UV light (254-366 mμ) or by specific spray reagents; Rf values were calculated.

II) Hydrolysis. Substances were hydrolysed with dilute sulfuric acid and the cleavage products were detected as follows:

a. The formaldehyde was identified either with an ammoniacal silver nitrat solution- silver mirror was produced- or with an alkalin potassium permanganate solution (4)- the color of the solution was discharged-.

b. Saccharin. The residual hydrolysate from (a) was applied to chromatographic plates and developed with different systems. Saccharin was detected on chromatograms as a violet spot under UV light (366 mμ), as a yellow spot with iodine vapors or in different colors with pH indicators. For comparison, saccharin was treated as described in the test II.

c. Amine. The hydrolysate from (a) was made alkalin to lithmus with aqueous sodium hydroxide 10 % solution and extracted with chloroform. The combined extracts were evaporated as a small volume. The residue when chromatographed together with the reference amine, the same Rf values and colors were obtained, and when diazotized in a porcelen disk, colors obtained with α-naphtylamine and α-naphtol were identical to that of the reference amine.

III) Spectra. UV spectra (unless otherweis) were taken with VSU 1 Model Zeiss Spectrophotometer; for IR spectra, Perkin-Elmer, Model 137 and KBr disk was used. NMR spectra were measured in a solvent or solvent mixtures using Varian NMR Spectrometer.

N-(m-nitroanilinomethyl) saccharin (I) : Prepared according to the above mentioned general method using 7.0 g of m-nitroanilin and heating the mixture on a water-bath for 4 hrs. The solvent is evaporated to a half volume, 20 ml ether is added and allowed to stand for 48 hrs. in a refrigerator. Crystals were separeted by decantation, washed first with 10 % ammonia solution, then with a small amount of ethanol and finally with ether. Yield 72 %. m.p. 210-211°.
$\lambda_{max.}^{MeOH}$ at 220 and 365 mμ.

IR spectrum. ν 3333 cm^{-1} (N-H, streching) ; 3030 cm^{-1} (aromatic C—H) ; 2865 cm^{-1} (aliphatic C—H) ; 1724 cm^{-1} (C=0) ; 1608, 1534, 1504 and 1477 cm^{-1} (aromatic ring, C=C) ; 1550 and 1333 cm^{-1} (N=0) ; 1445 cm^{-1} (aliphatic C—H, bending) ; 1325 cm^{-1} and 1183 cm^{-1} (S=0) ; 1285 and 1235 cm^{-1} (C—N) ; 881 cm^{-1} (C—2H, out of plan bending in 1,3-disubstituted benzen ring) ; 787 cm^{-1} (C—4,5,6H, in 1,3-disubstituted benzen) ; 752 cm^{-1} (C—3,4,5,6H, out of plan bending in 1,2-disubstituted benzen ring). (Fig. 1).

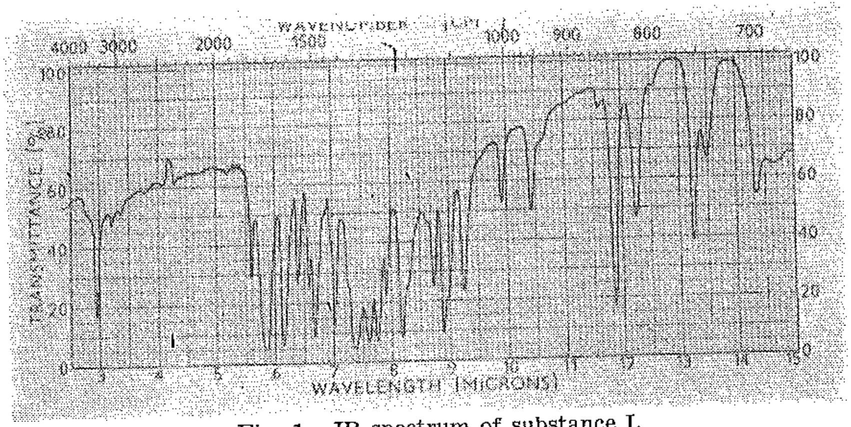


Fig. 1. IR spectrum of substance I.

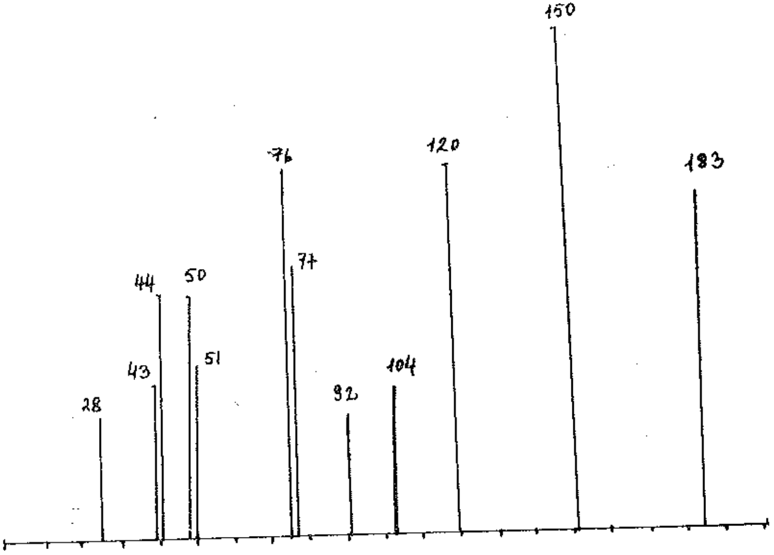


Fig. 2. Mass spectrum of substance I.

Mass spectrum. Besides of the base peak m/e 150, there are also another important peaks i.e. 183, 93,92,... produced from saccharin and m/e 150, 120, 104, 77,76,... from amine component and m/e 65, 51,50, 39, 28, 27 from all two components (Fig. 2).

Anal. Calculated for $C_{14}H_{11}N_3O_5S$: C, 50.44; H, 3.32; N, 12.60; S, 9.61. Found : C, 50.30; H, 3.39; N, 12.52; S, 9.52.

N-(p-nitroanilinomethyl) saccharin (II) : Prepared according to the above mentioned method, using 7.0 g of p-nitroanilin and heating on a water-bath for 4 hrs. Yield 74 %. Dark yellow cubic crystals. m.p. 165-166°. $\lambda_{max.}^{MeOH}$ at 228 and 371 mμ.

IR spectrum. ν 3344 cm^{-1} (N—H) ; 3030 cm^{-1} (aromatic C—H) ; 2985 cm^{-1} (aliphatic C—H) ; 1727 cm^{-1} (C=O) ; 1623, 1587 and 1511 cm^{-1} (aromatic ring. C=C); 1531 and 1342 cm^{-1} (N=O) ; 1451 cm^{-1} (—CH_2—, bending) ; 1323 and 1183 cm^{-1} (S=O) ; 1287 and 1232 cm^{-1} (C—N) ; 805 cm^{-1} (C—5,6H, out of plan bending in 1,4— disubstituted benzen ring) ; 755 cm^{-1} (C—3,4,5,6H in 1,2-disubstituted benzen ring) (Fig. 3).

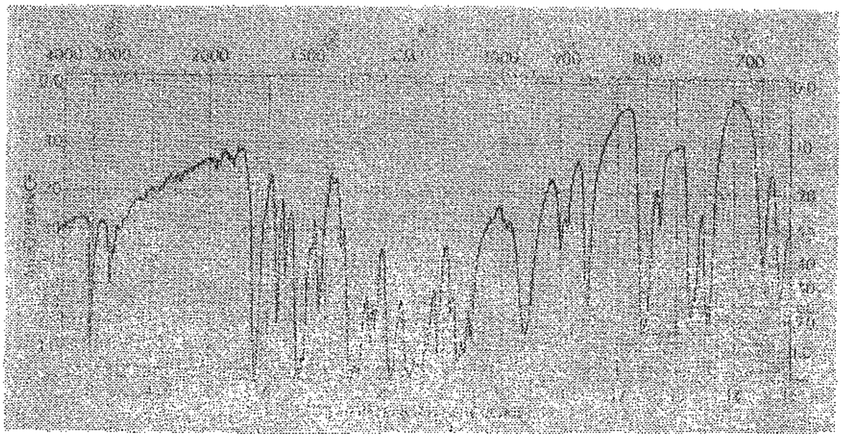


Fig. 3. IR spectrum of substance II.

NMR spectrum. (Varian A 100). The signals at 5.37 and 5.54 ppm with an entegral of 2H(doublet) for methylene protons of formaldehyde; 6.80-7.29 ppm with an entegral of 2H(tetret) for o-protons of p-nitroanilin; 7.30-7.50 ppm with an entegral of 1H (broad triplet) for the proton of secondary amine; 7.91-8.31 ppm with an entegral of 6H(multiplet) for m-protons of amine and of saccharin (Fig. 4).

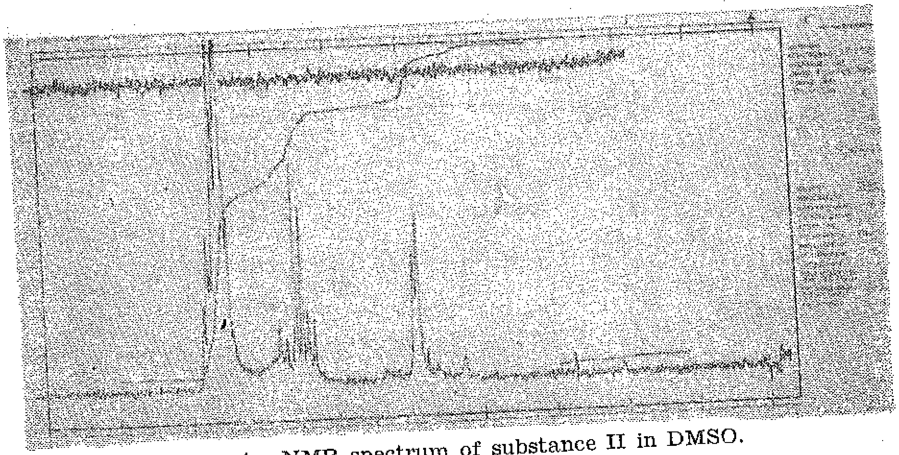


Fig. 4. NMR spectrum of substance II in DMSO.

Anal. Calculated for $C_{14}H_{11}N_3O_5S$: C, 50.44; H, 3.32; N, 12.60; S, 9.61. Found : C, 50.74; H, 3.50; N, 12.90; S, 9.16.

N-(o-carbethoxyanilinomethyl) saccharin (III) : Prepared according to the above mentioned general method using 13.70 g of o-carboxyanilin and heating the mixture on a water-bath for 4 hrs. At the end of this time, the crude product is purified by shaking with acetone. Yield 43 %. Light yellow prismatic crystals. m.p. 208-209°. $\lambda_{max.}^{MeOH}$ at 278 and 330 mμ.

IR spectrum. ν 3333 cm^{-1} (N—H) ; 3021 cm^{-1} (aromatic C—H) ; 2941 cm^{-1} and 2899 cm^{-1} (aliphatic C—H) ; 1718 and 1704 cm^{-1}

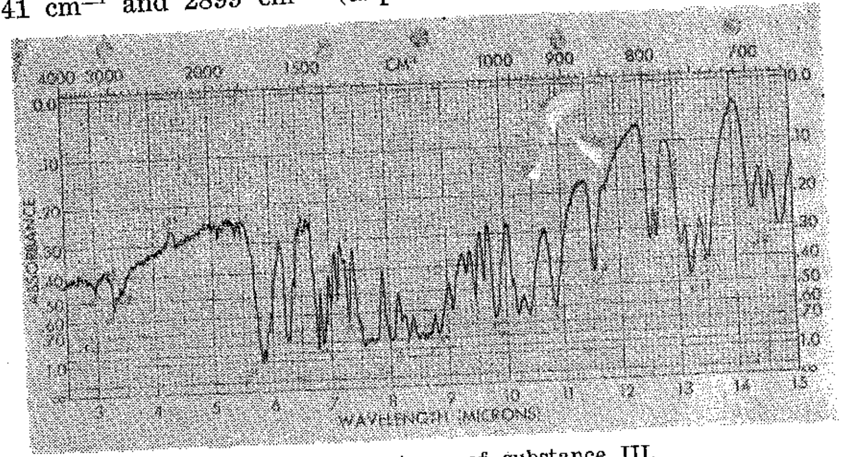


Fig. 5. IR spectrum of substance III.

(C=O); 1600, 1477 and 1460 cm^{-1} (C=C); 1429 and 1385 cm^{-1} (—CH_2— bending); 1325 and 1163 cm^{-1} (S=O); 1370 and 1242 cm^{-1} (C—N); 1198 cm^{-1} (C—O, streching); 756 cm^{-1} (out of plan bending of four adjacent hydrogens in 1,2-disubstituted benzen ring) (Fig. 5).

Anal. Calculated for $C_{17}H_{16}N_2O_5S$: C, 56.66; H, 4.47; N, 7.78; S, 8.90. Found : C, 56.77; H, 3.78; N, 7.97; S, 9.01.

Other papers related with will be published on further in this journal.

SUMMARY

In this study; m-nitroanilin, p-nitroanilin and o-carboxyanilin were condensed with saccharin and paraformaldehyde in ethanol to give three new derivatives, N-(m-nitroanilinomethyl) saccharin (I), N-(p-nitroanilinomethyl) saccharin (II) and N-(o-carbethoxyanilinomethyl) saccharin (III). After purification by chromatography, their structures have been elucidated by cleavage reactions and spectroscopic methods.

ÖZET

Bu çalışmamızda sakarinin m-nitroanilin, p-nitroanilin ve o-karboksianilinle etanollü vasatta, paraformaldehid beraberinde verdiği üç yeni maddenin, N-(nitroanilinometil) sakarin (I), N-(p-nitroanilinometil) sakarin (II), N-(o-karbetoksianilinometil) sakarin (III) sentezi yapılmış, kromatografik olarak temizlenen maddelerin yapıları kimyasal ve spektral metodlarla aydınlatılmıştır.

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