IV.—*Tesla-luminescence Spectra. Part VI. Some Amino-derivatives.*

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In previous papers (J., 1923, **123**, 642, 817, 2147; 1924, **125**, 1743; 1925, **127**, 999) accounts were given of the Tesla-luminescence spectra of various benzene derivatives. The present communication contains a description of the emission spectra of some aromatic amino-derivatives. The apparatus used is the same as before, the pressures were 1—2 mm., and the exposure was in each case 15 minutes.

Aniline, b. p. 182·9°/748 mm. A strong continuous spectrum, 2880—4000 Å.U., fading off gradually at both ends, with a number of well-defined narrow bands at 2895, 2915, 2927, 2938, 2960, 2976, 2985, 2999, 3010, 3022, 3031, 3050, 3070, 3098, 3122, 3145, 3171, 3199, 3224.

The spectra of the next seven substances faded gradually at both ends, but more so at the end of greater wave-length.

Monomethylaniline, b. p. 196·4—196·9°/770 mm. A strong continuous spectrum at approximately 2965—4250 Å.U. The centre of maximum intensity is about 3300 Å.U.

Monoethylaniline, b. p. 205·6—206·2°/770 mm. A strong continuous spectrum at approximately 2695—4250 Å.U. The centre of maximum intensity is about 3340 Å.U.

Dimethylaniline, b. p. 194·2—194·3°/766 mm. A strong continuous spectrum at approximately 3025—4300 Å.U. Centre of maximum intensity at approximately 3420 Å.U.

Diethylaniline, b. p. 213·2—214°/738 mm. Medium continuous spectrum at approximately 3010—4225 Å.U. Centre of maximum intensity at approximately 3375 Å.U.

iso*Amylaniline*, b. p. 253·6—255·6°/766 mm. Strong continuous spectrum at approximately 2995—4300 Å.U. Centre of maximum intensity at about 3340 Å.U.

Benzylamine, b. p. 184·6—185·2°/771 mm. Weak continuous spectrum at approximately 2671—3390 Å.U. Diffuse heads of bands at 2671, 2714, 2800.

Benzylaniline, b. p. 320·8—321·0°/775 mm. Strong continuous spectrum at approximately 2980—4225 Å.U. Centre of maximum intensity at approximately 3345 Å.U.

Diphenylamine, b. p. 302·6—302·8°/750 mm. Weak continuous spectrum at approximately 3070—3875 Å.U., fading off gradually at both ends.

Triphenylamine. Nine times recrystallised from alcohol and boiled once with animal charcoal. M. p. 126·4°. Moderate continuous spectrum at approximately 3260—4220 Å.U., fading off gradually at both ends.

Benzidine, m. p. 125—127°. Strong continuous spectrum at about 3200—4600 Å.U., fading off gradually at both ends but more so at the end of shorter wave-length. Centre of maximum emission at approximately 3830 Å.U.

Hydrazobenzene, m. p. 126—127°. Very faint, continuous spectrum at approximately 3050—4125 Å.U., fading off gradually at both ends, but more so at end of greater wave-length. Centre of maximum intensity at approximately 3340 Å.U.

Phenylhydrazine, b. p. 241·0—241·5°/763 mm. Weak continuous spectrum at approximately 2980—3640 Å.U., fading off gradually at both ends. Possibly there are faint narrow bands at 3024 and 3052 Å.U.

α-*Methylphenylhydrazine*, b. p. 101—103°/28—29 mm. Strong continuous spectrum at approximately 2940—4225 Å.U., fading off gradually at both ends, but more so at the end of greater wave-length. Centre of maximum intensity at approximately 3345 Å.U.

α-*Naphthylamine*, b. p. 299·4—299·7°/774 mm. Intense continuous spectrum at approximately 3320—4700 Å.U., fading off gradually at both ends with a diffuse head at about 3780 Å.U.

Signs of very indistinct bands were observed at approximately 3340, 3399, 3443, and 3506 Å.U., but the phenomena are doubtful.

β-*Naphthylamine*, m. p. 110°. Intense continuous spectrum at approximately 3280—4700 Å.U., fading off gradually at both ends. Centre of maximum intensity at approximately 3800 Å.U.

Ammonia. The ammonia spectrum contains two maxima at 3360 and 3371 Å.U. and a band system extending from these in both directions to 3286 and 3450, respectively. Possibly there may be two bands in the visible region at 5690 and 6600 Å.U. These bands are very indefinite. The spectrum in general is that of ammonia in a vacuum tube excited by an ordinary induction coil discharge.

On collating the foregoing data, some points of interest are found. The attachment of the amino-group directly to the benzene ring has the effect of shifting the region of emission towards the red end. Replacement of the hydrogen atoms of the amino-group by alkyl radicals has no profound influence on the spectral character of the emission. When phenyl groups are introduced into the amino-radical, the first phenyl group weakens the intensity of the spectrum as a whole, whilst a second phenyl radical increases the intensity slightly, though not enough to bring it back to the intensity of aniline.

The replacement of one hydrogen atom of the amino-group by the group $-NH_2$ so as to form phenylhydrazine, has a marked influence on the spectrum. Aniline has a strong emission with a length of 1120 units; the emission of phenylhydrazine is weak and extends over only 660 units. If the imino-group of phenylhydrazine carries a methyl group, $NMePh\cdot NH_2$, both the intensity and the extent of the emission are increased. On the other hand, the introduction of a phenyl group, forming $NHPh\cdot NHPh$, weakens the intensity of the spectrum but increases the extent of the emission.

The influence of constitution upon the spectra is seen by comparing the following data :

		Intensity.	Emission region.
Diphenylmethane	CH_2Ph_2	Medium	2673—3900
Diphenylamine	$NHPh_2$	Weak	3070—3875
Dibenzyl	$CH_2Ph\cdot CH_2Ph$	Faint	2700—4300
Hydrazobenzene	$NHPh\cdot NHPh$	Very faint	3050—4125
Benzidine	$NH_2\cdot C_6H_4\cdot C_6H_4\cdot NH_2$	Strong	3200—4600
Diphenyl	$C_6H_5\cdot C_6H_5$	Faint	2890—3900

Obviously when imino-groups are substituted for methylene groups the intensity is weakened and the spectrum is truncated at the violet end. Hydrazobenzene has a very faint spectrum, whereas the spectrum of benzidine is strong. The intensity of the benzidine spectrum is not due to the close proximity of the two phenyl nuclei, since the parent substance, diphenyl, has only a faint spectrum. The difference in the spectra of the two isomeric compounds must therefore be sought in difference between the group —NH—NH— on the one hand and the two primary amino-groups on the other.

The introduction of an amino-group into naphthalene has the effect of shortening the original spectrum at both ends while making it more intense in the region in which it still persists.

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