Mass Spectrometric Investigations of Phenylacetic Acid Derivatives, III:

Fragmentations of meta- and para-substituted Phenylacetamides after Electron Impact

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The electron impact induced fragmentations of m- and p-substituted phenylacetamides and N,N-dimethyl-phenylacetamides **1–14** were investigated and compared with the o-analogues. All m- and p-substituted amides yield molecular ions with high relative intensities which do not lose their meta- and para-substituents. Loss of HNCO from $M^{+\cdot}$ is dominant in the prim. amides, whilst for the tert. amides the classical benzyl cleavage is the most favourable fragmentation pathway.

Massenspektrometrische Untersuchungen an Derivaten der Phenylessigsäure, 3. Mitt.: Elektronenstoß-induzierter Zerfall meta- und parasubstituierter Phenylacetamide

Die Elektronenstoß-induzierten Fragmentierungen der m- und p-substituierten Phenylacetamide bzw. N,N-Dimethyl-phenylacetamide **1–14** wurden untersucht und mit dem Verhalten ihrer o-substituierten Analogen verglichen. Alle m- und p-substituierten Amide zeigen $M^{+\cdot}$ mit hoher relat. Intensität und spalten die m- bzw. p-Substituenten nicht ab. Die prim. Amide verlieren bevorzugt HNCO aus $M^{+\cdot}$, während in den tert. Amiden klassische Benzylspaltung vorherrscht.

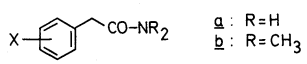
We have previously reported on the fragmentations of ortho-substituted phenylacetamides[2] and phenylacetates[3] after electron impact. Of the ortho-substituted phenylacetamides studied (substituent X = Cl, Br, F, NO_2, OCH_3, CH_3, and CN) only the o-Cl-, o-Br-, and o-NO_2-amides lose the ortho substituents directly from their $M^{+\cdot}$ giving rise to large $(M-{}^{\cdot}X)^+$-signals, and do not yield detectable $M^{+\cdot}$(<0.1 % rel. int.) at high and low ionizing energies. The loss of HNCO from $M^{+\cdot}$ of all ortho-substituted primary amides occurs to various degrees (12–100 % rel. int.) depending on the nature of the substituent (see[2]). In o-substituted tert. amides, however, the "classical" benzyl cleavage is a main fragmentation. The loss of o-substituents was explained assuming an intramolecular aromatic substitution[2][3], which is a typical example of an ortho effect in aromatic systems[4].

In parallel with these studies the behaviour of meta- and para-substituted phenylacetamides **1–14** was investigated in order to clarify how the position of these substituents influences the fragmentation reactions.

The EIMS of the amides **1–14** show molecular ions of varying intensities without exception (7–95 % at 70 eV and 13–100 % at nom. 12 eV). A direct loss of the substituent X from $M^{+\cdot}$ was not detected for any compound (see Tab. 1 and 2).

Loss of HNCO

As shown in scheme 1 (as examplified for a p-substituted amide) and Tab. 1 the molecular ions of the prim. amides **1a–14a** generally lose HNCO, induced by H-migration from the amide N-atom, being the main fragmentation reaction in many cases. The resulting radical cation **A** subsequently eliminates a hydrogen atom yielding the $(M-{}^{\cdot}CONH_2)^+$ ion (this ion is also produced directly from $M^{+\cdot}$ by benzyl cleavage as indicated by *Holmes* and *Benoit*[5]), or alternatively the substituent X to give the $C_7H_7^+$ ion (m/z 91) in all cases at



a: R=H
b: R=CH_3

	X		X		X
1	m-NO_2	6	p-Br	11	m-OCH_3
2	p-NO_2	7	m-F	12	p-OCH_3
3	m-Cl	8	p-F	13	m-CN
4	p-Cl	9	m-CH_3	14	p-CN
5	m-Br	10	p-CH_3		

Tab. 1: Excerpt of the EIMS-data of the meta- and para-substituted prim. phenylacetamides **1a–14a** at 70/12 eV

compd	$M^{+\cdot}$	$(M-HNCO)^{+\cdot}$	$(M-{}^{\cdot}CONH_2)^+$	$(M-HNCO-{}^{\cdot}X)^+$	$O=C=NH_2^+$
1a	7/17	100/100	5/–	21/–	40/–
2a	15/20	100/100	2/–	15/–	25/–
3a	45/100	71/75	32/–	100/–	35/–
4a	55/100	100/57	98/–	100/–	37/–
5a	63/100	100/64	29/–	75/9	37/–
6a	55/100	91/15	67/–	100/–	51/–
7a	50/100	100/76	90/–	< 1/–	33/–
8a	34/100	80/19	100/–	< 1/–	17/–
9a	73/100	100/70	73/–	78/–	11/–
10a	50/100	68/57	100/11	39/–	6/–
11a	95/100	100/25	55/–	47/–	13/–
12a	62/100	37/9	100/56	52/–	3/–
13a	13/32	100/100	20/–	5/–	21/–
14a	18/81	100/100	23/–	3/–	27/–

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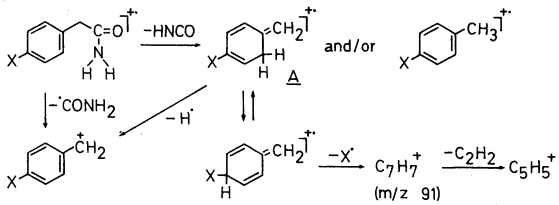
Tab. 2: Excerpt of the EIMS-data of the meta- and para-substituted N,N-dimethyl-phenylacetamides **1b–14b** at 70/12 eV

compd	$M^{+\cdot}$	$(M-HNMe_2)^{+\cdot}$	$(M-\cdot CONMe_2)^{+}$	$O=C=NMe_2^{+}$
1b	7/13	–	4/–	100/100
2b	8/42	–	1/–	100/100
3b	14/100	1/–	6/–	100/43
4b	13/42	–	7/–	100/100
5b	20/69	2/–	10/–	100/100
6b	72/46	6/–	25/–	100/100
7b	14/100	2/–	11/–	100/71
8b	26/100	2/–	13/–	100/36
9b	35/100	4/–	12/–	100/36
10b	35/100	3/–	16/–	100/34
11b	64/100	8/–	19/–	100/22
12b	41/100	2/–	100/24	58/4
13b	11/88	–	8/–	100/100
14b	14/100	–	10/–	100/90

70 eV. This ion does not appear in the low energy spectra of m- and p-substituted amides except in the case of **5a**, it is detected, however, in the case of o-Cl-, o-Br-, o-NO_2-, and o-OCH_3-substituted phenylacetamides at 70 eV[2].



Similar to o-fluorophenylacetamide, its meta- and para isomers **7a** and **8a** yield $(M\text{-}HNCO\text{-}\cdot X)^{+}$ ions (m/z 91) with less than 1 % rel. int., contrary to the very high intensities in the spectra of Cl- and Br-substituted analogues. This phenomenon may result from the differences of $C_{ar}-X$ bond dissociation energies (homopolar bond dissociation energy: 123.9 Kcal/mol for C_6H_5-F, 94.5 Kcal/mol for C_6H_5-Cl and 79.2 Kcal/mol for C_6H_5-Br[6]).

Funke et al.[7] have described the main fragmentation processes of phenylacetanilide which involve H-migration from the amide-N onto the benzyl group and/or onto the aromatic ring leading to the loss of C_6H_5NCO via a four- and/or a six-

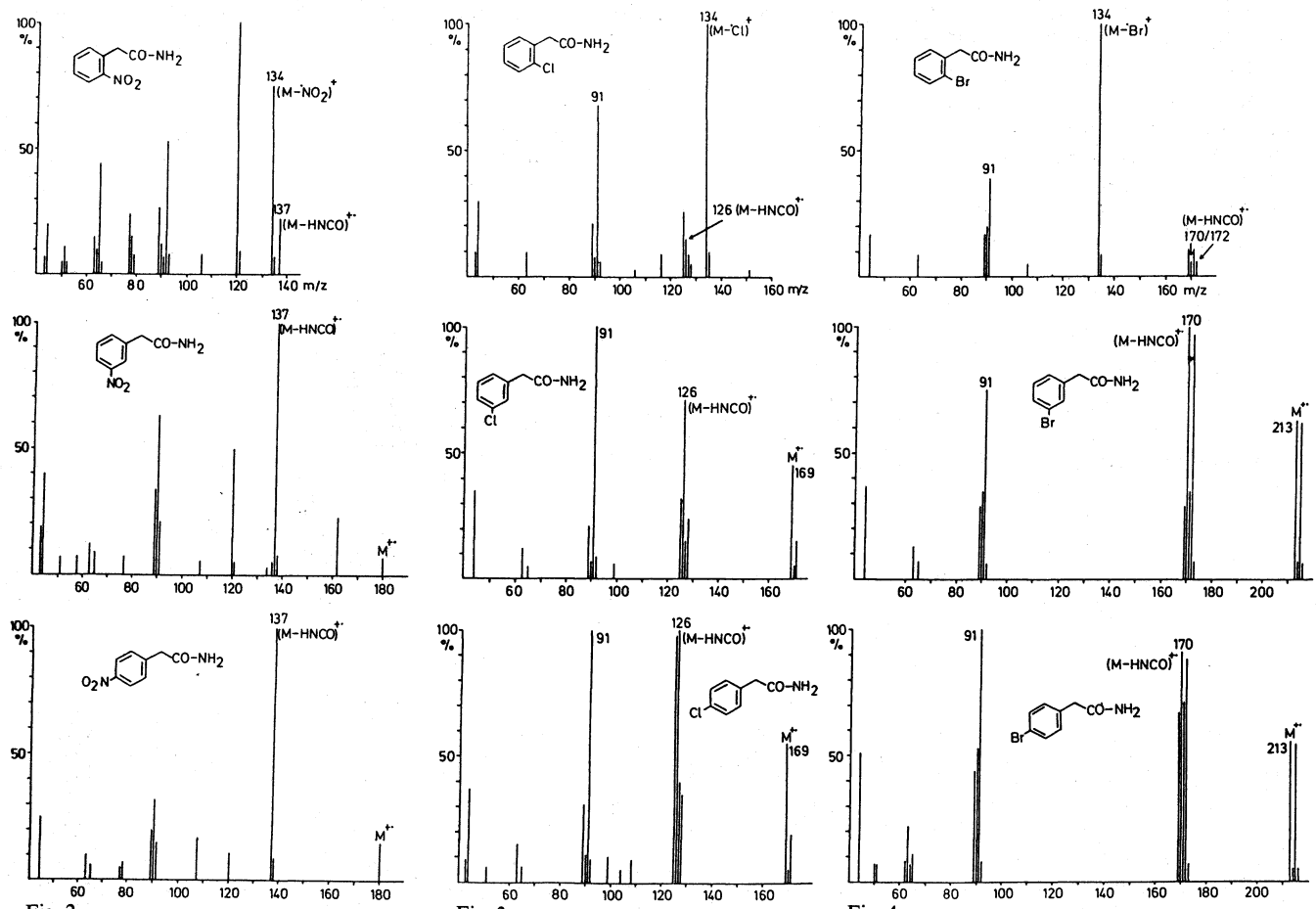


Fig. 2 Fig. 3 Fig. 4

membered transition state. Loss of HNCO occurs in all amides which include at least one hydrogen atom at the amide-N (**1a–14a**). *Holmes* and *Benoit*[5] discuss the loss of $^{\cdot}NH_2$ and $^{\cdot}CONH_2$ from $M^{+\cdot}$ of substituted benzamides and do not refer to a signal (12 % rel. int.) which is probably due to a $(M-HNCO)^{+\cdot}$-ion.

A comparison of the EI-spectra of o-, m-, and p-substituted phenylacetamides (X=Cl, Br, NO_2) is given in Fig. 2, 3 and 4.

In particular, while the molecular ions of o-Cl-, o-Br-, and o-NO_2-substituted primary amides lose HNCO to a minor extent only (6–15 % rel. int.), the molecular ions of their m-/p- isomers as well as the m-, p-, and o-isomers with $X = CH_3$, OCH_3, F, CN eliminate HNCO yielding very prominent signals (68–100 % rel. int.).

The predominance of $(M-{}^{\cdot}CONH_2)^+$ in **12a** is due to the stabilizing effect of p-OCH_3 onto the benzyl cation. Thus the fragmentation of the m- and p-substituted amides **1a–6a** is completely different from that of their ortho isomers as far as the production of $M^{+\cdot}$, $(M - {}^{\cdot}X)^+$, and $(M - HNCO)^{+\cdot}$ ions is concerned.

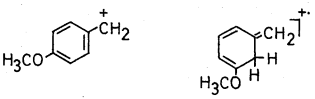
A similar phenomenon depending on the position of the substituent at the aromatic nucleus has been observed e. g. for phenylacetylpyrrolidines[8], cinnamic acids[9], acetanilides[10], and 1-phenyl-1-(2-pyridyl)ethylenes[11].

Benzyl cleavage

Contrary to the primary amides the most favourable fragmentation path of the N,N-dimethyl-phenylacetamides radical cations of **1b–14b** is the "classical" benzyl cleavage, producing $(CH_3)_2NCO^+$ ions as base-peaks except in the case of **12b** (Tab. 2). Here again stabilization of the pertinent benzyl cation occurs (see above). The same result was observed for the ortho-substituted N,N-dimethyl-phenylacetamides[2].

In parallel to the fragmentation of primary amides, these tert. amides yield $M^{+\cdot}$ with relatively high intensities at 70/12 eV and do not produce $(M - {}^{\cdot}X)^+$ ions in any cases. However, in contrast with the formation of the fragment-ion $[(C_6H_5)_2NH]^{+\cdot}$ (and/or its isomer[7]) causing the base-peak for N,N-diphenyl-phenylacetamides[2,7] the $[(CH_3)_2NH]^{+\cdot}$ fragment (m/z 45) appears with very low intensities – if at all – in the ms of **1b–14b** (see Tab. 5 in Exp. part). This can be explained by charge delocalization in $[(C_6H_5)_2NH]^{+\cdot}$, which is strongly diminished – if it occurs at all – in $[(CH_3)_2NH]^{+\cdot}$ (cf. *Stevenson's rule*[12]).

Especially we were interested to compare the fragmentations of the methoxy-substituted amides **11a, 11b, 12a** and **12b** and their ortho isomers. The base-peak of the meta-substituted primary amide **11a** corresponds to the $(M - HNCO)^{+\cdot}$ fragment-ion at m/z 122, whereas the product of $(M - {}^{\cdot}CONH_2)^+$ (m/z 121) gives rise to the base-peak for its para isomer **12a**; the base-peak of the ortho isomer stems from the loss of HNCO from $M^{+\cdot}$ succeded by $^{\cdot}OCH_3$-elimination yielding m/z 91[2]. The differences in the fragmentations of these three isomeric molecular ions are clearly envisaged in their meta-stable ion (B/E-linked scan) spectra (Tab. 3) which show the different ratio of the formation of the ions at m/z 121 and m/z 122, respectively.



m/z 121 m/z 122

Tab. 3: MIMS (B/E) of the molecular ions (m/z 165) of o-, m- and p-methoxy-substituted primary phenylacetamides

m/z	ortho	meta	para
150	23	–	–
148	100	11	4
147	22	–	–
134	11	–	–
122	93	100	8
121	81	–	100
107	16	–	–

In all cases of o-, m- and p-methoxy N,N-dimethyl-phenylacetamides the benzyl cleavage appears as an important fragmentation reaction, however, whilst the loss of a $(CH_3)_2NCO$-radical from $M^{+\cdot}$ corresponds to the base-peak for the **p**- isomers the $(CH_3)_2NCO^+$ ion causes the base-peak of the **o**- and **m**-isomers. In addition, the **m**-OCH_3-substituted amide **11b** yields the ion at m/z 135 (70/12 eV). Moreover, this ion represents the base-peak in the MIMS (B/E-linked scan). Its B^2/E-linked scan spectrum shows that this m/z 135 ion is derived from the molecular ion directly, its molecular composition is $C_9H_{11}O$ (HR; $M^{+\cdot} - C_2H_4NO$). Up to now we have no clear-cut explanation for this unexpected fragment which is obviously formed by a $^{\cdot}CH_3$-transfer.

Part I of this study[2] indicates significant differences between o-Cl-, o-Br-, and o-NO_2-substituted prim., sec., and tert. phenylacetamides which lose these substituents contrary to their o-F, o-CH_3, o-OCH_3 and o-CN analogues, which do not show this cleavage but are fragmented in the side chain as expected. On the other side the meta- and para chloro-, bromo-, and nitro-substituted isomers investigated in this paper behave "normally", i. e. they undergo cleavages in the side chain as do the meta- and para CH_3-, OCH_3-, F-, and CN-substituted phenylacetamides.

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Experimental Part

Standard mass spectrometric conditions: see[2].

The physical and spectroscopic data of unknown compounds are shown in Table 4, the intensities (70/12 eV, EIMS) of all peaks of compounds **1–14** are given in Table 5.

Preparation of **5a, 5b, 7a** *and* **7b**

m-Bromo- or m-fluorobenzylcyanides, respectively, were hydrolyzed with H_2SO_4 and acetic acid as reported[13] to give the corresponding acetic acids[13, 14], which were converted to the amides according to the general method[2].

Preparation of **13a, 13b, 14a** *and* **14b**

m- or p-Nitrophenylacetic acids, respectively, were hydrogenated with 5 % Pd-C/H_2 according to the procedure for a similar compound[15] to yield m- or p-aminophenylacetic acids[16, 17].

Tab. 4:

compound	mp. (°C)	IR (cm^{-1})	^{1}H-NMR[b]: δ (ppm)	Elementary analysis calcd/found
5a	138–139°	1660(CO) 3160 and 3340(NH_2)	3.50 (s; 2H, CH_2), 6.23 and 6.83 (2 × s; broad, 2H, NH_2), 7.07–7.53 (m; 4H, Ar)	C 44.9 H 3.77/ C 44.7 H 3.64
7a	140°	1650(CO) 3210 and 3400(NH_2)	3.53 (s; 2H, CH_2), 6.43 (s; broad, 1H, NH), 6.67–7.47 (m; 5H, NH, Ar)	C 62.7 H 5.27/ C 62.8 H 5.35
13a	117–118°	1660(CO) 2240(CN) 3200 and 3420(NH_2)	3.60 (s; 2H, CH_2), 6.23 and 6.93 (2 × s; broad, 2H, NH_2), 7.33–7.70 (m; 4H, Ar)	C 67.5 H 5.04/ C 67.1 H 5.17
14a	199–200°	1665(CO) 2240(CN) 3210 and 3450(NH_2)	3.60 (s; 2H, CH_2), 6.37 and 7.03 (2 × s; broad, 2H, NH_2), 7.50 (d; J = 7.5 Hz, 2H, Ar), 7.67 (d; J = 7.5 Hz, 2H, Ar)	C 67.5 H 5.04/ C 67.9 H 5.28
1b	50–51°	1650 and 1660(CO)	2.97 and 3.07 (2 × s; 6H, 2 × CH_3), 3.77 (s; 2H, CH_2), 7.23–7.67 (m; 2H, Ar), 8.00–8.20 (m; 2H, Ar)	C 57.7 H 5.82/ C 57.7 H 5.89
5b	a)	1645 and 1660(CO)	2.93 and 2.97 (2 × s; 6H, 2 × CH_3), 3.67 (s; 2H, CH_2), 7.10–7.43 (m; 4H, Ar)	
7b	a)	1640 and 1660(CO)	2.92 and 2.97 (2 × s; 6H, 2 × CH_3), 3.63 (s; 2H, CH_2), 6.83–7.33 (m; 4H, Ar)	
8b	42–43°	1640 and 1660(CO)	2.95 and 2.98 (2 × s; 6H, 2 × CH_3), 3.70 (s; 2H, CH_2), 6.77–7.40 (m; 4H, Ar)	C 66.3 H 6.69/ C 66.3 H 6.90
11b	a)	1650(CO)	2.93 and 2.97 (2 × s; 6H, 2 × CH_3), 3.67 (s; 2H, CH_2), 3.77 (s; 3H, OCH_3), 6.67–6.90 (m; 3H, Ar), 7.13 (d; J = 9 Hz, 1H, Ar)	
12b	a)	1650(CO)	2.90 and 2.93 (2 × s; 6H, 2 × CH_3), 3.60 (s; 2H, CH_2), 3.73 (s; 3H, OCH_3), 6.83 (d; J = 9 Hz, 2H, Ar), 7.13 (d; J = 9 Hz, 2H, Ar)	
13b	a)	1640 and 1660(CO) 2240(CN)	2.97 and 3.05 (2 × s; 6H, 2 × CH_3), 3.72 (s; 2H, CH_2), 7.30– 7.67 (m; 4H, Ar)	
14b	72–75°	1640 and 1660(CO) 2240(CN)	2.95 and 3.02 (2 × s; 6H, 2 × CH_3), 3.73 (s; 2H, CH_2), 7.37 (d; J = 7.5 Hz, 2H, Ar), 7.57 (d; J = 7.5 Hz, 2H, Ar)	C 70.2 H 6.44/ C 70.1 H 6.53

a) Boiling point was not measured.
b) $CDCl_3$ or DMSO-d_6 were used as solvents.

Tab. 5:

compound	$M^{+\cdot}$	EI–MS: m/z (% rel. int.) 70 eV	12 eV	FI–/FD– or HR–MS
1a	180	180(7), 162(23, *145.80), 150(1), 138(8), 137(100), 136(5), 121(5), 120(50, *105.11), 107(5), 91(21), 90(63), 89(34, *88.01), 77(7), 65(9), 63(12), 58(7), 51(7), 44(40), (43(19)	180(17), 163(5), 162(36), 138(8), 137(100), 134(3)	FD: 180(100), 78(36) HR: a)
2a	180	180(15), 138(9), 137(100), 136(2), 120(11), 107(17, *83.57), 91(15), 90(32, *67.50), 89(20), 78(7), 77(5), 65(6), 63(10), 44(25)	180(20), 138(16), 137(100)	
3a	169/ 171	171(15), 170(5), 169(45), 128(24), 127(15), 126(71, * 93.94), 125(32), 99(6), 92(9), 91(100, *65.72), 90(7), 89(21, * 88.01), 65(5), 63(12), 44(35)	171(32), 170(9), 169(100), 128(25), 127(6), 126(75)	
4a	169/ 171	171(19), 170(5), 169(55), 128(35), 127(40), 126(100, *93.94), 125(98), 109(9), 104(5), 99(10), 92(9), 91(100, *65.72), 90(11), 89(31), 65(6), 63(15), 51(6), 44(37), 43(9)	171(32), 170(10), 169(100), 128(20), 127(3), 126(57)	
5a	213/ 215	216(6), 215(62), 214(7), 213(63), 173(7), 172(97), 171(35), 170(100, *135.68), 169(29), 92(6), 91(75), 90(35, *89.01), 89(29, *88.01), 65(7), 63(13), 44(37)	216(9), 215(98), 214(11), 213(100), 173(5), 172(69), 171(5), 170(64), 91(9)	
6a	213/ 215	216(5), 215(54), 214(5), 213(55), 173(7), 172(88, *137.60), 171(71), 170(91, *135.68), 169(67), 92(8), 91(100), 90(53), 89(44), 65(11, *46.43), 64(7), 63(22), 62(8), 51(7), 50(7), 44(51)	216(8), 215(95), 214(9), 213(100), 172(15), 170(15)	
7a	153	154(6), 153(50), 111(8), 110(100), 109(90), 108(5), 107(7), 91(< 1), 90(< 1), 89(3), 83(18), 63(5), 57(6), 44(33)	154(9), 153(100), 111(6), 110(76)	
8a	153	153(34), 135(2), 111(6), 110(80), 109(100), 108(5), 107(7), 91(< 1), 90(< 1), 89(3), 83(27), 57(5), 44(17)	154(9), 153(100), 110(19)	

com-pound	mol wt.	EI–MS: m/z (% rel. int.) 70 eV	12 eV	FI–/FD– or HR–MS
9a	149	150(8), 149(73), 132(1), 131(2), 107(10), 106(100, *75.41), 105(73), 104(6), 103(14, *101.04), 92(6), 91(78, *78.12), 89(2, *87.04), 79(17, *59.44), 78(9), 77(23), 65(6), 63(5), 51(9), 44(11)	150(10), 149(100), 107(5), 106(70)	
10a	149	150(6), 149(50), 107(6), 106(68), 105(100), 104(6), 103(11, *101.04), 91(39, *78.12), 79(13), 78(7), 77(19), 51(6), 44(6)	150(11), 149(100), 107(5), 106(57), 105(11)	
11a	165	166(10), 165(95), 148(1), 147(1), 123(9), 122(100), 121(55), 107(27, *93.84), 92(16), 91(47, *68.44), 90(16), 89(8), 79(12), 78(13), 77(21), 65(12), 51(8), 44(13), 43(24)	166(10), 165(100), 122(25)	
12a	165	166(6), 165(62), 148(5), 122(37), 121(100, *88.73), 107(16), 93(6), 92(6), 91(52, *68.44), 78(6), 77(11), 65(9), 51(5), 44(3), 43(5)	166(11), 165(100), 148(3), 122(9), 121(56)	
13a	160	160(13), 118(10), 117(100), 116(20), 91(5), 90(26), 89(21), 63(8), 58(30), 44(21), 43(71)	160(32), 118(13), 117(100)	
14a	160	160(18), 142(3), 118(10), 117(100), 116(23), 91(3), 90(27), 89(20), 63(8), 44(27)	161(11), 160(81), 142(4), 118(11), 117(100)	
1b	208	208(7), 136(4), 90(6), 89(6), 73(3), 72(100), 44(7), 43(10)	208(13), 178(2), 72(100)	
2b	208	208(8), 178(3, *152.33), 136(1), 106(1), 90(2), 89(4, *88.01), 78(1), 73(3), 72(100), 44(6)	209(7), 208(42), 178(11), 73(5), 72(100)	
3b	197/ 199	199(5), 198(2), 197(14), 152(1), 125(6), 99(1), 89(5), 72(100), 45(1), 44(5)	199(35), 198(12), 197(100), 72(43)	
4b	197/ 199	199(5), 198(2), 197(13), 127(2), 125(7), 89(6), 73(4), 72(100), 45(< 0.5)	199(13), 198(5), 197(42), 72(100)	
5b	241/ 243	243(19), 241(20), 198(2), 196(2), 171(9), 169(10), 90(15), 89(17), 73(8), 72(100), 63(8), 45(2), 44(9), 42(7)	244(8), 243(70), 242(9), 241(69), 72(100)	
6b	241/ 243	244(8), 243(70), 242(9), 241(72), 198(6), 196(6), 171(25), 170(5), 169(25), 91(5), 90(33), 89(35), 73(24), 72(100), 63(19), 45(3), 44(16), 43(6), 42(14)	244(5), 243(44), 242(5), 241(46), 72(100)	
7b	181	181(14), 136(2), 109(11), 101(5), 83(5), 72(100), 59(14), 58(7), 45(2), 44(8), 43(32)	182(11), 181(100), 72(71)	
8b	181	181(26), 136(2), 109(13), 108(3), 107(2, *106.01), 89(1), 83(5, *63.20), 73(4), 72(100), 45(< 0.5), 44(4)	182(12), 181(100), 72(36)	
9b	177	178(5), 177(35), 132(4), 105(12), 104(3), 103(3), 72(100)	178(13), 177(100), 72(36)	
10b	177	178(4), 177(35), 132(3), 105(16), 77(6), 72(100)	178(12), 177(100), 72(34)	
11b	193	194(8), 193(64), 192(3, *191.01), 178(1), 164(1), 148(8, *113.49), 136(6), 135(9), 121(19), 91(14), 78(7), 77(6), 73(8), 72(100), 65(5), 44(5)	194(10), 193(100), 135(2), 72(22)	HR: b)
12b	193	194(4), 193(41), 148(2, *113.49), 135(1), 122(9), 121(100), 91(4, *68.44), 78(5), 77(5), 72(58)	194(12), 193(100), 121(24), 72(4)	
13b	188	188(11), 116(8), 89(5, *68.28), 72(100), 44(7)	189(13), 188(88), 72(100)	
14b	188	188(14), 116(10), 89(9), 73(6), 72(100), 63(5), 44(11)	189(14), 188(100), 72(90)	

a)	$C_8H_8N_2O_3$	calcd 180.05349	found 180.05346 (Δm 0.2 ppm)
	$C_8H_6N_2O_2$	162.04292	162.04308 (Δm 1.0 ppm)
	$C_7H_7NO_2$	137.04768	137.04779 (Δm 0.8 ppm)
	C_7H_6NO	120.04494	120.04499 (Δm 0.4 ppm)
b)	$C_{11}H_{15}NO_2$	193.11027	193.10984 (Δm 2.2 ppm)
	$C_9H_{11}O$	135.08098	135.08055 (Δm 3.2 ppm)

These acids were converted to the corresponding cyanophenylacetic acids[18, 19] using the *Sandmeyer* reaction as reported[19]. The amides were obtained from m- or p-cyanophenylacetic acid according to the general method[2].

The other amides were prepared from the corresponding phenylacetic acids (Aldrich Chem. Co.): see[2].

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