Electronic Supplementary Information (ESI)

Towards Physical Interpretation of Substituent Effects: the Case of *meta* and *para*-substituted Anilines

Halina Szatylowicz,[a]* Tomasz Siodla,[b] Olga A. Stasyuk[a] and Tadeusz M. Krygowski[c]

[a] Faculty of Chemistry, Warsaw University of Technology, Noakowskiego 3, 00-664 Warsaw, Poland. Email: halina@ch.pw.edu.pl

[b] Faculty of Chemistry, Adam Mickiewicz University, Umultowska 89b, 61-614 Poznań, Poland

[c] Department of Chemistry, Warsaw University, Pasteura 1, 02-093 Warsaw, Poland

Table 1S. SESE values (in kcal/mol) for *para*- and *meta*-substituted anilines obtained at different computational level ESI 2

Table 2S. cSAR values for *para*- and *meta*-substituted anilines obtained basing on different assessments of atomic charges ESI 3

Table 3S. The range of variation in SE descriptors for *para*- and *meta*-substituted anilines ESI 4

Figure 1S. Relations between NICS(0), NICS(1) and SESE values for *meta*- and *para*-substituted aniline derivatives ESI 4

Figure 2S. Correlation between NH bond length, dNH, and NMR shielding, δ(N), for *meta*- and *para*-substituted aniline derivatives. R2=0.950 for a joint data ESI 5

Figure 3S. Correlation between $cSAR(X)_{meta}$ and $cSAR(X)_{para}$ for X-substituted aniline derivatives ESI 5

Table 1S. SESE values (in kcal/mol) for *para*- and *meta*-substituted anilines obtained at different computational level.

	MP2			**B3LYP**			**M06-2X**			**HF**		
X	**6-31+Gdp**	**6-311++Gdp**	**aug-cc-pVDZ**	**6-31+Gdp**	**6-311++Gdp**	**aug-cc-pVDZ**	**6-31+Gdp**	**6-311++Gdp**	**aug-cc-pVDZ**	**6-31+Gdp**	**6-311++Gdp**	**aug-cc-pVDZ**
para-												
NO	2,19	2,05	2,14	4,30	4,17	4,10	3,24	3,11	3,09	2,81	2,64	2,63
NO_2	1,34	1,29	1,38	3,32	3,17	3,17	2,73	2,61	2,61	3,12	2,94	2,93
CN	1,16	1,19	1,19	2,28	2,25	2,21	2,04	2,00	2,00	2,16	2,09	2,11
CF_3	0,95	0,83	0,94	1,66	1,56	1,53	1,43	1,41	1,36	1,52	1,47	1,44
$COCH_3$	1,32	1,26	1,29	2,36	2,30	2,28	1,95	1,90	1,89	2,11	2,02	2,01
COOH	1,35	1,31	1,33	2,51	2,45	2,44	2,16	2,11	2,12	2,51	2,40	2,41
CHO	1,58	1,52	1,58	2,87	2,80	2,79	2,42	2,33	2,37	2,40	2,29	2,33
$CONH_2$	0,66	0,61	0,81	1,61	1,53	1,56	1,37	1,31	1,35	1,66	1,59	1,63
Cl	-0,31	-0,31	-0,39	-0,23	-0,27	-0,29	-0,28	-0,33	-0,34	-0,15	-0,21	-0,24
F	-1,15	-1,11	-1,16	-1,22	-1,19	-1,27	-1,35	-1,31	-1,39	-1,51	-1,48	-1,52
H	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Me	-0,44	-0,42	-0,43	-0,61	-0,65	-0,64	-0,63	-0,67	-1,28	-0,75	-0,78	-0,77
OMe	-1,54	-1,49	-1,58	-2,05	-2,05	-2,10	-2,11	-2,11	-2,16	-2,33	-2,32	-2,36
OH	-1,62	-1,58	-1,68	-2,15	-2,14	-2,19	-2,22	-2,20	-2,27	-2,51	-2,49	-2,54
NH_2	-1,87	-1,94	-1,74	-2,58	-2,57	-2,57	-2,57	-2,54	-2,55	-2,84	-2,80	-2,79
NMe_2	-1,63	-1,50	-1,40	-2,53	-2,56	-2,56	-2,49	-2,50	-2,51	-1,02	-1,18	-1,27
meta-												
NO	0,69	0,80	0,75	0,84	0,83	0,75	0,62	0,57	0,55	-0,09	-0,08	-0,09
NO_2	1,27	1,11	1,24	0,78	0,75	0,66	0,72	0,66	0,63	-0,11	-0,08	-0,13
CN	0,81	0,89	0,89	0,64	0,62	0,58	0,55	0,51	0,52	0,09	0,08	0,09
CF_3	0,63	0,65	0,68	0,57	0,56	0,48	0,58	0,60	0,52	0,12	0,11	0,12
$COCH_3$	0,30	0,36	0,26	0,57	0,55	0,49	0,52	0,48	0,45	0,00	0,00	-0,04
COOH	0,67	0,72	0,62	0,36	0,33	0,30	0,34	0,27	0,29	-0,33	-0,34	-0,32
CHO	0,46	0,52	0,45	0,70	0,69	0,64	0,63	0,57	0,57	0,05	0,04	0,04
$CONH_2$	0,44	0,43	0,17	0,74	0,70	0,66	0,76	0,70	0,70	0,29	0,27	0,24
Cl	0,40	0,42	0,36	0,35	0,34	0,34	0,32	0,30	0,33	0,39	0,39	0,41
F	0,17	0,23	0,18	0,46	0,46	0,39	0,49	0,48	0,44	0,93	0,92	0,87
H	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Me	-0,12	-0,12	-0,13	0,00	-0,03	-0,04	0,06	0,03	0,06	0,26	0,24	0,23
OMe	-0,01	0,16	0,01	0,24	0,24	0,21	0,34	0,35	0,33	1,11	1,07	1,05
OH	0,10	0,15	0,08	0,48	0,47	0,42	0,55	0,56	0,52	1,32	1,28	1,25
NH_2	-0,32	-0,31	-0,32	0,18	0,14	0,11	0,30	0,28	0,26	1,15	1,11	1,07
NMe_2	-0,30	-0,17	-0,12	-0,03	-0,04	-0,06	0,24	0,24	0,24	0,92	0,89	0,83

Table 2S. cSAR values for *para*- and *meta*-substituted anilines obtained basing on different assessments of atomic charges.

	NBO[a]		VDD[b]		AIM[c]	
X	cSAR(NH_2)	cSAR(X)	cSAR(NH_2)	cSAR(X)	cSAR(NH_2)	cSAR(X)
para-						
NO	0.212	-0.285	0.192	-0.221	0.107	-0.257
NO_2	0.188	-0.284	0.142	-0.229	0.105	-0.352
CN	0.190	-0.265	0.161	-0.229	0.090	-0.231
CF_3	0.154	-0.213	0.148	-0.151	0.077	-0.205
$COCH_3$	0.168	-0.225	0.149	-0.148	0.074	-0.137
COOH	0.171	-0.257	0.155	-0.173	0.077	-0.200
CHO	0.180	-0.248	0.164	-0.178	0.086	-0.161
$CONH_2$	0.153	-0.192	0.140	-0.127	0.067	-0.128
Cl	0.136	-0.081	0.113	-0.090	0.058	-0.192
F	0.100	0.014	0.100	-0.040	0.049	-0.180
H	0.132	-0.043	0.106	-0.035	0.040	-0.011
Me	0.119	-0.039	0.092	-0.014	0.033	0.026
OMe	0.075	0.052	0.070	0.035	0.027	-0.049
OH	0.071	0.061	0.075	0.036	0.032	-0.056
NH_2	0.080	0.080	0.062	0.062	0.020	0.020
NMe_2	0.060	0.060	0.062	0.074	0.015	0.041
meta-						
NO	0.144	-0.171	0.129	-0.138	0.079	-0.208
NO_2	0.162	-0.184	0.142	-0.146	0.090	-0.318
CN	0.141	-0.184	0.139	-0.177	0.082	-0.203
CF_3	0.135	-0.142	0.133	-0.102	0.075	-0.184
$COCH_3$	0.134	-0.133	0.111	-0.087	0.054	-0.099
COOH	0.118	-0.174	0.118	-0.111	0.061	-0.168
CHO	0.123	-0.153	0.119	-0.112	0.065	-0.122
$CONH_2$	0.120	-0.109	0.113	-0.074	0.056	-0.097
Cl	0.160	-0.016	0.126	-0.048	0.069	-0.179
F	0.144	0.075	0.131	-0.004	0.070	-0.170
H	0.132	0.020	0.106	0.004	0.040	-0.011
Me	0.119	0.021	0.104	0.027	0.036	0.043
OMe	0.129	0.117	0.113	0.075	0.050	-0.030
OH	0.136	0.120	0.120	0.073	0.056	-0.040
NH_2	0.129	0.129	0.109	0.109	0.042	0.042
NMe_2	0.126	0.139	0.104	0.125	0.036	0.074

[a]Weinhold, [b]Voronoi and [c]Bader assessment methods of atomic charges.

Table 3S. The range of variation in SE descriptors for *para*- and *meta*-substituted anilines.

	Ranges		
	para-	*meta*-	% *meta*- *vs para*-
$\sigma_{p,m}$	1,74	0,87	50,0
SESE /kcal/mol	6,88	0,87	12,6
cSAR(NH_2)	0,152	0,044	28,9
cSAR(X)	0,365	0,323	88,5
HOMA	0,062	0,037	59,7
$d_{C\text{-}N}$ /Å	0,0352	0,0112	31,8
$d_{N\text{-}H}$ /Å	0,0036	0,0011	30,6
Σ_{NH2} /deg	14,0	4,1	29,3
δ(N) /ppm	13,171	2,183	16,6

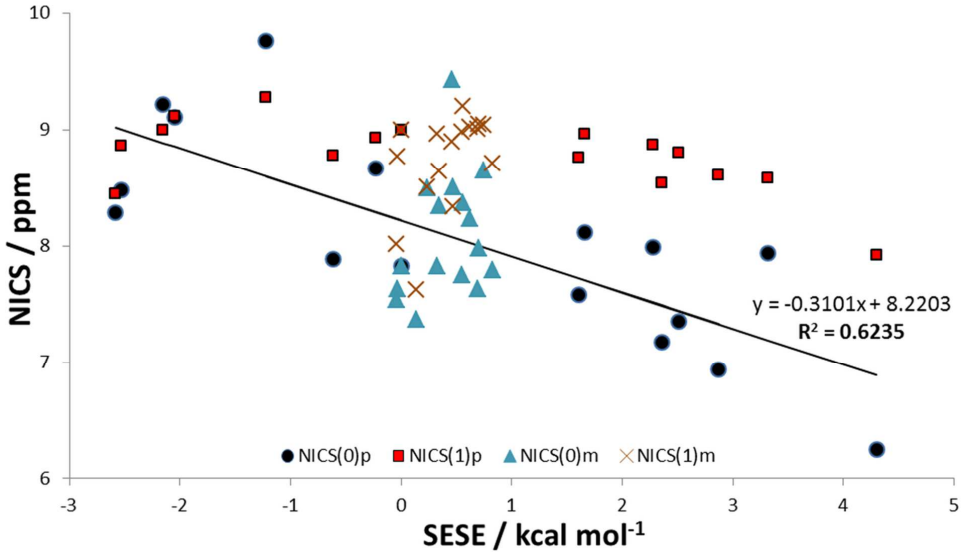

Figure 1S. Relations between NICS(0), NICS(1) and SESE values for *meta*- and *para*-substituted aniline derivatives.

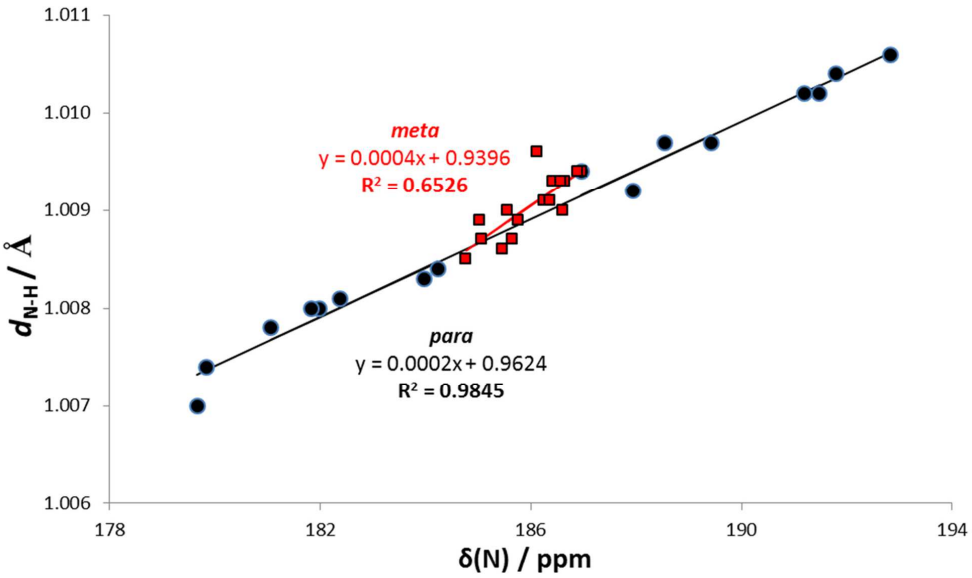

Figure 2S. Correlation between NH bond length, d_{NH}, and NMR shielding, δ(N), for *meta*- and *para*-substituted aniline derivatives. R^2=0.950 for a joint data.

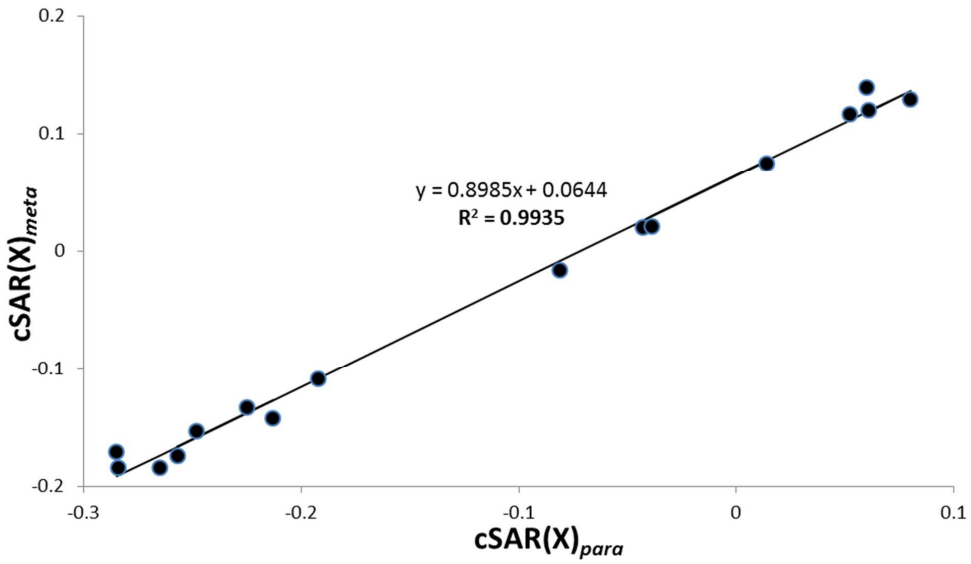

Figure 3S. Correlation between $cSAR(X)_{meta}$ and $cSAR(X)_{para}$ for X-substituted aniline derivatives.