Table 4. Calculated IMFPs for the 41 elemental solids as a function of electron kinetic energy *E*.

	Inelastic mean free path (Å)						
E (eV)	Li	Be	C (graphite)	C (diamond)	C (glassy)	Na	Mg
54.6	4.84	3.56	4.57	6.25	5.75	5.25	4.10
60.3	5.12	3.60	4.40	5.69	5.77	5.56	4.26
66.7	5.43	3.68	4.30	5.26	5.77	5.90	4.45
73.7	5.77	3.78	4.27	4.96	5.84	6.27	4.66
81.5	6.14	3.91	4.29	4.77	5.96	6.66	4.89
90.0	6.54	4.07	4.35	4.68	6.12	7.08	5.15
99.5	6.98	4.25	4.44	4.65	6.30	7.53	5.42
109.9	7.45	4.45	4.57	4.68	6.54	8.01	5.72
121.5	7.97	4.68	4.73	4.76	6.80	8.53	6.06
134.3	8.53	4.94	4.92	4.88	7.11	9.09	6.41
148.4	9.15	5.22	5.14	5.04	7.44	9.70	6.80
164.0	9.81	5.53	5.39	5.23	7.83	10.4	7.22
181.3	10.5	5.87	5.67	5.46	8.26	11.1	7.67
200.3	11.3	6.24	5.99	5.71	8.81	11.8	8.16
221.4	12.1	6.65	6.33	6.00	9.34	12.7	8.69
244.7	13.1	7.09	6.72	6.33	9.86	13.6	9.27
270.4	14.1	7.58	7.14	6.70	10.5	14.6	9.90
298.9	15.1	8.11	7.61	7.10	11.2	15.7	10.6
330.3	16.4	8.76	8.12	7.52	12.0	17.0	11.4
365.0	17.7	9.38	8.69	8.02	12.8	18.3	12.2
403.4	19.2	10.1	9.31	8.56	13.8	19.7	13.1
445.9	20.7	10.8	9.99	9.16	14.8	21.2	14.0
492.7	22.4	11.6	10.7	9.81	15.9	22.9	15.1
544.6	24.3	12.5	11.5	10.5	17.1	24.7	16.2
601.8	26.3	13.5	12.4	11.3	18.4	26.7	17.5
665.1	28.5	14.5	13.4	12.1	19.8	28.9	18.9
735.1	30.9	15.7	14.4	13.0	21.4	31.3	20.4
812.4	33.5	16.9	15.5	14.0	23.0	33.8	22.0
897.8	36.4	18.3	16.8	15.1	24.8	36.7	23.8
992.3	39.5	19.8	18.1	16.3	26.8	39.8	25.7
1096.6	42.9	21.4	19.6	17.6	29.0	43.1	27.8
1212.0	46.6	23.2	21.1	19.0	31.4	46.8	30.2
1339.4	50.7	25.1	22.9	20.5	33.9	50.9	32.7
1480.3	55.1	27.3	24.8	22.1	36.7	55.2	35.4
1636.0	59.9	29.6	26.8	24.0	39.8	60.0	38.4

1808.0	65.2	32.1	29.1	25.9	43.1	65.3	41.7
1998.2	71.0	34.8	31.5	28.1	46.8	71.0	45.3
2208.3	77.3	37.8	34.2	30.4	50.8	77.2	49.2
2440.6	84.2	41.1	37.1	33.0	55.1	84.0	53.5
2697.3	91.7	44.7	40.3	35.8	59.9	91.4	58.1
2981.0	99.9	48.6	43.8	38.8	65.0	99.6	63.2
3294.5	108.9	52.8	47.6	42.1	70.7	108.4	68.7
3640.9	118.7	57.5	51.7	45.8	76.9	118.1	74.8
4023.9	129.4	62.6	56.3	49.7	83.6	128.6	81.4
4447.1	141.1	68.1	61.2	54.0	90.9	140.2	88.6
4914.8	153.9	74.2	66.6	58.8	99.0	152.8	96.4
5431.7	167.9	80.8	72.5	63.9	107.7	166.6	105.0
6002.9	183.2	88.0	78.9	69.5	117.3	181.6	114.4
6634.2	199.9	95.9	85.9	75.6	127.8	198.1	124.7
7332.0	218.2	104.5	93.6	82.3	139.2	216.1	135.9
8103.1	238.2	113.9	102.0	89.6	151.7	235.8	148.1
8955.3	260.1	124.2	111.1	97.6	165.3	257.3	161.5
9897.1	284.0	135.5	121.1	106.3	180.2	280.8	176.1
10938.0	310.2	147.8	132.0	115.9	196.5	306.5	192.1
12088.4	338.8	161.2	144.0	126.3	214.3	334.7	209.6
13359.7	370.1	175.9	157.0	137.6	233.8	365.4	228.7
14764.8	404.4	192.0	171.3	150.1	255.1	399.1	249.6
16317.6	441.9	209.6	186.9	163.6	278.4	435.9	272.4
18033.7	483.0	228.8	204.0	178.5	303.8	476.3	297.4
19930.4	527.9	249.8	222.6	194.7	331.6	520.3	324.7
22026.5	577.1	272.8	243.0	212.4	362.1	568.6	354.6
24343.0	631.0	298.0	265.3	231.8	395.4	621.4	387.3
26903.2	689.9	325.5	289.7	253.0	431.8	679.2	423.0
29732.6	754.5	355.6	316.4	276.2	471.6	742.5	462.2

Table 4. (Continued.)

	Inelastic mean free path (Å)						
E (eV)	Al	Si	K	Sc	Ti	V	Cr
54.6	3.58	4.18	7.39	4.58	4.11	4.54	4.34
60.3	3.68	4.29	7.72	4.57	4.09	4.49	4.26
66.7	3.82	4.42	8.08	4.57	4.09	4.48	4.21
73.7	3.97	4.59	8.48	4.60	4.12	4.49	4.21
81.5	4.15	4.78	8.95	4.67	4.19	4.54	4.24
90.0	4.34	5.00	9.42	4.76	4.28	4.62	4.30
99.5	4.56	5.25	9.93	4.88	4.40	4.71	4.40
109.9	4.81	5.52	10.5	5.00	4.51	4.82	4.51
121.5	5.08	5.82	11.2	5.15	4.64	4.97	4.66
134.3	5.37	6.16	11.9	5.33	4.79	5.12	4.82
148.4	5.69	6.52	12.7	5.56	4.98	5.30	5.01
164.0	6.03	6.92	13.6	5.84	5.21	5.50	5.21
181.3	6.41	7.35	14.6	6.15	5.47	5.73	5.44
200.3	6.82	7.81	15.6	6.50	5.77	5.99	5.70
221.4	7.28	8.32	16.8	6.89	6.10	6.29	6.00
244.7	7.75	8.88	18.1	7.32	6.47	6.63	6.32
270.4	8.28	9.49	19.4	7.80	6.88	7.01	6.69
298.9	8.84	10.2	21.0	8.33	7.32	7.42	7.09
330.3	9.56	11.0	22.8	8.91	7.82	7.86	7.53
365.0	10.2	11.8	24.6	9.55	8.36	8.37	8.02
403.4	10.9	12.6	26.6	10.2	8.95	8.93	8.55
445.9	11.7	13.5	28.7	11.0	9.60	9.54	9.13
492.7	12.6	14.5	31.1	11.8	10.3	10.2	9.77
544.6	13.5	15.5	33.6	12.7	11.1	10.9	10.5
601.8	14.5	16.7	36.4	13.7	11.9	11.7	11.2
665.1	15.6	18.0	39.5	14.8	12.8	12.6	12.1
735.1	16.9	19.4	42.8	15.9	13.9	13.6	13.0
812.4	18.2	20.9	46.3	17.2	14.9	14.6	14.0
897.8	19.6	22.5	50.2	18.6	16.1	15.8	15.0
992.3	21.2	24.3	54.5	20.1	17.4	17.0	16.2
1096.6	22.9	26.3	59.1	21.8	18.9	18.4	17.5
1212.0	24.8	28.5	64.1	23.5	20.4	19.8	18.9
1339.4	26.9	30.8	69.6	25.5	22.1	21.4	20.5
1480.3	29.1	33.4	75.6	27.6	23.9	23.2	22.1
1636.0	31.6	36.2	82.1	29.9	25.8	25.1	23.9
1808.0	34.2	39.2	89.2	32.4	28.0	27.1	25.9
1998.2	37.1	42.5	97.0	35.1	30.3	29.4	28.0

2208.3	40.3	46.2	105.5	38.1	32.9	31.8	30.3
2440.6	43.8	50.1	114.8	41.3	35.7	34.5	32.9
2697.3	47.6	54.5	125.0	44.9	38.7	37.4	35.6
2981.0	51.7	59.2	136.0	48.7	42.0	40.5	38.6
3294.5	56.2	64.3	148.1	53.0	45.7	44.0	41.9
3640.9	61.1	70.0	161.4	57.6	49.6	47.7	45.5
4023.9	66.5	76.1	175.8	62.6	53.9	51.9	49.4
4447.1	72.4	82.8	191.6	68.1	58.6	56.3	53.7
4914.8	78.8	90.1	208.8	74.1	63.8	61.2	58.4
5431.7	85.8	98.1	227.7	80.6	69.4	66.6	63.5
6002.9	93.4	106.9	248.3	87.8	75.5	72.4	69.0
6634.2	101.7	116.4	270.8	95.6	82.2	78.8	75.1
7332.0	110.8	126.8	295.4	104.1	89.5	85.7	81.7
8103.1	120.8	138.2	322.4	113.4	97.5	93.3	88.9
8955.3	131.7	150.6	351.8	123.6	106.2	101.6	96.8
9897.1	143.6	164.2	384.0	134.7	115.7	110.7	105.4
10938.0	156.5	179.1	419.2	146.8	126.1	120.6	114.9
12088.4	170.7	195.3	457.7	160.1	137.5	131.4	125.2
13359.7	186.3	213.0	499.8	174.6	149.9	143.2	136.4
14764.8	203.2	232.4	545.9	190.4	163.5	156.1	148.7
16317.6	221.8	253.6	596.3	207.8	178.3	170.2	162.1
18033.7	242.1	276.8	651.4	226.7	194.6	185.6	176.8
19930.4	264.2	302.2	711.8	247.4	212.3	202.5	192.8
22026.5	288.5	329.9	777.8	270.1	231.7	220.9	210.4
24343.0	315.1	360.3	850.1	294.8	252.9	241.0	229.5
26903.2	344.1	393.5	929.2	321.9	276.1	263.0	250.5
29732.6	375.9	429.8	1015.8	351.5	301.5	287.1	273.4

Table 4. (Continued.)

	Inelastic mean free path (Å)					
E (eV)	Fe	Co	Ni	Cu	Ge	Y
54.6	4.28	4.84	4.77	4.94	4.08	5.04
60.3	4.25	4.68	4.68	4.87	4.18	5.05
66.7	4.26	4.58	4.59	4.84	4.31	5.09
73.7	4.30	4.52	4.58	4.84	4.45	5.16
81.5	4.37	4.51	4.55	4.87	4.62	5.25
90.0	4.47	4.52	4.59	4.93	4.80	5.36
99.5	4.57	4.55	4.63	5.00	5.02	5.50
109.9	4.70	4.61	4.70	5.11	5.25	5.67
121.5	4.86	4.70	4.80	5.24	5.51	5.89
134.3	5.05	4.83	4.92	5.40	5.79	6.15
148.4	5.25	4.98	5.07	5.58	6.09	6.46
164.0	5.47	5.13	5.24	5.79	6.43	6.81
181.3	5.71	5.30	5.45	6.02	6.79	7.20
200.3	5.98	5.50	5.67	6.29	7.18	7.64
221.4	6.28	5.74	5.91	6.58	7.61	8.13
244.7	6.61	6.00	6.19	6.90	8.07	8.66
270.4	6.97	6.30	6.49	7.25	8.58	9.24
298.9	7.38	6.63	6.83	7.64	9.13	9.88
330.3	7.85	7.00	7.23	8.15	9.86	10.7
365.0	8.33	7.41	7.64	8.60	10.5	11.5
403.4	8.86	7.85	8.09	9.11	11.2	12.3
445.9	9.44	8.35	8.60	9.67	12.0	13.2
492.7	10.1	8.89	9.15	10.3	12.8	14.2
544.6	10.8	9.49	9.75	10.9	13.7	15.3
601.8	11.5	10.1	10.4	11.7	14.7	16.4
665.1	12.4	10.9	11.1	12.5	15.8	17.7
735.1	13.3	11.6	11.9	13.4	16.9	19.1
812.4	14.3	12.5	12.8	14.3	18.2	20.6
897.8	15.4	13.4	13.8	15.4	19.6	22.2
992.3	16.6	14.5	14.8	16.6	21.1	23.9
1096.6	17.9	15.6	15.9	17.8	22.8	25.8
1212.0	19.3	16.8	17.2	19.2	24.6	27.9
1339.4	20.8	18.1	18.5	20.7	26.6	30.2
1480.3	22.5	19.6	20.0	22.3	28.7	32.7
1636.0	24.3	21.1	21.6	24.1	31.1	35.3
1808.0	26.3	22.9	23.4	26.1	33.6	38.3
1998.2	28.5	24.7	25.3	28.2	36.4	41.5

2208.3	30.9	26.8	27.4	30.5	39.5	45.0
2440.6	33.4	29.0	29.7	33.1	42.8	48.8
2697.3	36.2	31.4	32.1	35.8	46.5	53.0
2981.0	39.3	34.0	34.8	38.8	50.4	57.5
3294.5	42.6	36.9	37.7	42.1	54.8	62.5
3640.9	46.3	40.0	40.9	45.6	59.5	67.9
4023.9	50.2	43.4	44.4	49.5	64.7	73.8
4447.1	54.5	47.1	48.2	53.7	70.3	80.3
4914.8	59.3	51.2	52.3	58.3	76.4	87.3
5431.7	64.4	55.6	56.9	63.4	83.1	95.0
6002.9	70.0	60.4	61.8	68.8	90.4	103.4
6634.2	76.2	65.7	67.2	74.8	98.4	112.6
7332.0	82.9	71.5	73.1	81.4	107.1	122.6
8103.1	90.2	77.7	79.5	88.5	116.6	133.5
8955.3	98.2	84.6	86.5	96.3	127.0	145.5
9897.1	106.9	92.1	94.1	104.8	138.3	158.5
10938.0	116.4	100.3	102.5	114.1	150.7	172.8
12088.4	126.8	109.2	111.6	124.3	164.2	188.3
13359.7	138.2	118.9	121.6	135.4	179.0	205.3
14764.8	150.6	129.6	132.4	147.5	195.2	223.9
16317.6	164.2	141.2	144.3	160.7	212.9	244.3
18033.7	179.0	153.9	157.3	175.2	232.2	266.5
19930.4	195.2	167.8	171.5	191.0	253.4	290.8
22026.5	212.9	183.0	187.0	208.2	276.5	317.4
24343.0	232.3	199.6	204.0	227.1	301.8	346.4
26903.2	253.5	217.8	222.5	247.7	329.4	378.2
29732.6	276.7	237.6	242.8	270.3	359.6	413.0

Table 4. (Continued.)

	Inelastic mean free path (Å)						
E (eV)	Nb	Mo	Ru	Rh	Pd	Ag	In
54.6	5.50	4.77	4.68	4.57	4.64	5.91	4.79
60.3	5.36	4.56	4.46	4.37	4.44	5.63	4.86
66.7	5.26	4.44	4.29	4.21	4.27	5.39	4.95
73.7	5.21	4.37	4.16	4.08	4.16	5.18	5.05
81.5	5.20	4.34	4.09	4.01	4.08	5.05	5.16
90.0	5.24	4.35	4.05	3.96	4.04	4.94	5.28
99.5	5.30	4.39	4.05	3.96	4.04	4.88	5.43
109.9	5.38	4.47	4.09	3.99	4.07	4.87	5.59
121.5	5.47	4.56	4.15	4.05	4.13	4.89	5.78
134.3	5.59	4.66	4.25	4.14	4.21	4.94	6.00
148.4	5.75	4.79	4.37	4.25	4.33	5.01	6.24
164.0	5.95	4.96	4.51	4.39	4.47	5.13	6.51
181.3	6.20	5.16	4.67	4.54	4.63	5.28	6.81
200.3	6.49	5.40	4.86	4.72	4.81	5.46	7.15
221.4	6.82	5.68	5.08	4.92	5.02	5.66	7.52
244.7	7.20	5.99	5.34	5.16	5.26	5.89	7.93
270.4	7.62	6.34	5.63	5.43	5.53	6.16	8.37
298.9	8.09	6.72	5.96	5.73	5.85	6.47	8.87
330.3	8.62	7.15	6.30	6.04	6.16	6.74	9.34
365.0	9.21	7.63	6.71	6.43	6.56	7.15	9.96
403.4	9.85	8.16	7.16	6.85	7.00	7.61	10.6
445.9	10.6	8.74	7.66	7.32	7.48	8.11	11.4
492.7	11.3	9.37	8.20	7.84	8.01	8.66	12.2
544.6	12.1	10.1	8.79	8.40	8.58	9.26	13.1
601.8	13.0	10.8	9.44	9.01	9.21	9.92	14.1
665.1	14.0	11.6	10.1	9.68	9.90	10.6	15.1
735.1	15.0	12.5	10.9	10.4	10.6	11.4	16.3
812.4	16.1	13.4	11.7	11.2	11.5	12.3	17.6
897.8	17.4	14.4	12.6	12.1	12.3	13.2	18.9
992.3	18.7	15.5	13.6	13.0	13.3	14.2	20.4
1096.6	20.1	16.7	14.6	14.0	14.3	15.2	22.1
1212.0	21.7	18.0	15.8	15.1	15.4	16.4	23.9
1339.4	23.4	19.4	17.0	16.2	16.7	17.7	25.8
1480.3	25.3	21.0	18.3	17.5	18.0	19.0	27.9
1636.0	27.3	22.6	19.8	18.9	19.4	20.5	30.1
1808.0	29.5	24.5	21.4	20.4	21.0	22.2	32.6
1998.2	31.9	26.4	23.1	22.1	22.7	23.9	35.3

2208.3	34.5	28.6	25.0	23.9	24.5	25.9	38.2
2440.6	37.4	31.0	27.1	25.8	26.6	28.0	41.4
2697.3	40.5	33.6	29.3	28.0	28.8	30.3	44.9
2981.0	43.9	36.4	31.8	30.3	31.2	32.8	48.6
3294.5	47.6	39.5	34.4	32.9	33.8	35.6	52.8
3640.9	51.7	42.8	37.3	35.6	36.7	38.6	57.3
4023.9	56.1	46.5	40.5	38.7	39.8	41.8	62.2
4447.1	60.9	50.5	44.0	42.0	43.2	45.4	67.6
4914.8	66.2	54.8	47.8	45.6	46.9	49.3	73.4
5431.7	71.9	59.6	51.9	49.5	51.0	53.6	79.8
6002.9	78.2	64.8	56.4	53.8	55.4	58.2	86.8
6634.2	85.1	70.4	61.3	58.5	60.2	63.2	94.4
7332.0	92.5	76.6	66.7	63.6	65.5	68.8	102.7
8103.1	100.7	83.4	72.6	69.2	71.3	74.8	111.8
8955.3	109.6	90.7	79.0	75.3	77.5	81.4	121.8
9897.1	119.3	98.8	86.0	82.0	84.4	88.5	132.6
10938.0	129.9	107.5	93.6	89.3	91.9	96.4	144.4
12088.4	141.5	117.1	101.9	97.2	100.1	104.9	157.4
13359.7	154.2	127.6	111.0	105.9	109.0	114.3	171.5
14764.8	168.0	139.1	121.0	115.4	118.8	124.5	186.9
16317.6	183.1	151.6	131.8	125.8	129.5	135.6	203.8
18033.7	199.6	165.2	143.7	137.1	141.1	147.8	222.2
19930.4	217.7	180.2	156.7	149.4	153.9	161.1	242.4
22026.5	237.4	196.5	170.8	162.9	167.8	175.7	264.4
24343.0	259.0	214.3	186.3	177.7	183.0	191.6	288.5
26903.2	282.5	233.8	203.3	193.9	199.6	208.9	314.8
29732.6	308.3	255.1	221.8	211.5	217.8	227.9	343.6

Table 4. (Continued.)

E (eV)	Inelastic mean free path (Å)						
	Sn	Cs	Gd	Tb	Dy	Hf	Ta
54.6	5.82	6.57	4.14	4.08	4.44	5.43	4.71
60.3	5.88	6.92	4.15	4.06	4.39	5.37	4.58
66.7	5.94	7.31	4.19	4.06	4.37	5.33	4.51
73.7	6.03	7.74	4.26	4.09	4.40	5.33	4.47
81.5	6.12	8.22	4.36	4.14	4.44	5.34	4.48
90.0	6.26	8.73	4.48	4.21	4.50	5.39	4.49
99.5	6.39	9.29	4.61	4.29	4.59	5.46	4.54
109.9	6.57	9.89	4.79	4.40	4.70	5.55	4.60
121.5	6.78	10.5	5.01	4.54	4.84	5.67	4.70
134.3	7.01	11.3	5.25	4.71	5.01	5.81	4.82
148.4	7.27	12.0	5.51	4.92	5.22	5.98	4.95
164.0	7.55	12.9	5.79	5.15	5.44	6.19	5.11
181.3	7.87	13.8	6.11	5.40	5.71	6.43	5.30
200.3	8.22	14.8	6.46	5.70	6.01	6.72	5.52
221.4	8.62	15.9	6.86	6.02	6.34	7.03	5.77
244.7	9.05	17.1	7.28	6.38	6.70	7.39	6.05
270.4	9.53	18.4	7.74	6.78	7.11	7.79	6.37
298.9	10.1	19.8	8.24	7.21	7.55	8.23	6.72
330.3	10.5	21.4	8.93	7.76	8.13	8.80	7.17
365.0	11.2	23.0	9.51	8.27	8.65	9.34	7.60
403.4	11.9	24.8	10.2	8.83	9.22	9.92	8.07
445.9	12.8	26.8	10.9	9.44	9.84	10.6	8.58
492.7	13.6	28.9	11.6	10.1	10.5	11.2	9.14
544.6	14.6	31.3	12.5	10.8	11.3	12.0	9.74
601.8	15.7	33.8	13.4	11.6	12.1	12.8	10.4
665.1	16.8	36.6	14.4	12.5	13.0	13.7	11.1
735.1	18.1	39.7	15.5	13.5	13.9	14.7	11.9
812.4	19.5	43.0	16.7	14.5	15.0	15.7	12.8
897.8	21.0	46.6	18.0	15.6	16.2	16.9	13.7
992.3	22.6	50.5	19.4	16.8	17.4	18.1	14.7
1096.6	24.4	54.8	21.0	18.2	18.8	19.5	15.8
1212.0	26.4	59.5	22.7	19.6	20.3	21.0	17.0
1339.4	28.5	64.6	24.5	21.2	21.9	22.6	18.3
1480.3	30.8	70.2	26.5	23.0	23.7	24.4	19.7
1636.0	33.3	76.3	28.7	24.8	25.6	26.3	21.3
1808.0	36.0	82.9	31.1	26.9	27.7	28.4	23.0
1998.2	38.9	90.1	33.7	29.1	30.0	30.7	24.8

2208.3	42.1	98.0	36.5	31.6	32.5	33.2	26.8
2440.6	45.6	106.6	39.6	34.3	35.2	35.9	29.0
2697.3	49.4	115.9	43.0	37.2	38.2	38.9	31.4
2981.0	53.5	126.2	46.6	40.3	41.5	42.1	34.0
3294.5	58.0	137.3	50.7	43.8	45.0	45.6	36.8
3640.9	63.0	149.5	55.0	47.6	48.9	49.5	39.9
4023.9	68.3	162.8	59.8	51.7	53.1	53.7	43.3
4447.1	74.2	177.3	65.0	56.2	57.6	58.3	47.0
4914.8	80.6	193.2	70.6	61.1	62.6	63.3	51.0
5431.7	87.6	210.6	76.8	66.4	68.1	68.7	55.4
6002.9	95.2	229.5	83.5	72.2	74.0	74.6	60.2
6634.2	103.5	250.3	90.9	78.6	80.5	81.1	65.4
7332.0	112.6	272.9	98.9	85.5	87.6	88.1	71.0
8103.1	122.6	297.7	107.6	93.1	95.4	95.8	77.2
8955.3	133.4	324.8	117.2	101.3	103.8	104.2	84.0
9897.1	145.2	354.4	127.7	110.4	113.0	113.4	91.4
10938.0	158.1	386.8	139.1	120.2	123.1	123.4	99.4
12088.4	172.3	422.2	151.6	131.0	134.1	134.3	108.2
13359.7	187.7	460.9	165.2	142.8	146.2	146.3	117.8
14764.8	204.5	503.3	180.1	155.7	159.3	159.3	128.3
16317.6	222.9	549.7	196.4	169.7	173.7	173.6	139.8
18033.7	243.0	600.4	214.2	185.1	189.4	189.1	152.3
19930.4	265.0	655.9	233.7	201.9	206.6	206.1	166.0
22026.5	289.0	716.6	255.0	220.3	225.3	224.7	180.9
24343.0	315.2	783.0	278.2	240.4	245.8	245.0	197.2
26903.2	343.9	855.8	303.7	262.4	268.2	267.2	215.1
29732.6	375.3	935.3	331.5	286.4	292.8	291.5	234.6

Table 4. (Continued.)

	Inelastic mean free path (Å)						
E (eV)	W	Re	Os	Ir	Pt	Au	Bi
54.6	5.04	5.04	5.29	5.01	4.81	4.95	4.96
60.3	4.77	4.73	5.01	4.74	4.59	4.75	5.02
66.7	4.60	4.49	4.77	4.53	4.44	4.60	5.09
73.7	4.49	4.32	4.61	4.36	4.30	4.49	5.15
81.5	4.43	4.22	4.50	4.25	4.21	4.41	5.27
90.0	4.41	4.18	4.43	4.19	4.16	4.38	5.40
99.5	4.43	4.17	4.41	4.16	4.15	4.34	5.54
109.9	4.49	4.20	4.44	4.18	4.19	4.36	5.70
121.5	4.57	4.25	4.51	4.23	4.25	4.40	5.88
134.3	4.67	4.33	4.59	4.31	4.34	4.48	6.09
148.4	4.78	4.44	4.69	4.41	4.45	4.58	6.31
164.0	4.92	4.57	4.82	4.55	4.59	4.72	6.57
181.3	5.09	4.71	4.97	4.70	4.75	4.88	6.86
200.3	5.28	4.89	5.14	4.87	4.95	5.07	7.17
221.4	5.51	5.09	5.35	5.07	5.17	5.29	7.53
244.7	5.77	5.32	5.59	5.31	5.41	5.54	7.93
270.4	6.06	5.59	5.86	5.57	5.68	5.82	8.36
298.9	6.38	5.89	6.16	5.86	5.99	6.13	8.85
330.3	6.79	6.25	6.55	6.22	6.36	6.47	9.35
365.0	7.19	6.62	6.93	6.60	6.74	6.87	9.96
403.4	7.63	7.03	7.34	7.00	7.16	7.31	10.6
445.9	8.11	7.47	7.80	7.45	7.62	7.78	11.4
492.7	8.62	7.94	8.29	7.93	8.12	8.29	12.2
544.6	9.19	8.47	8.83	8.45	8.66	8.87	13.0
601.8	9.80	9.03	9.42	9.02	9.24	9.47	14.0
665.1	10.5	9.65	10.1	9.63	9.88	10.1	15.0
735.1	11.2	10.3	10.7	10.3	10.6	10.8	16.1
812.4	12.0	11.1	11.5	11.0	11.3	11.6	17.3
897.8	12.8	11.8	12.3	11.8	12.1	12.5	18.7
992.3	13.8	12.7	13.2	12.7	13.0	13.4	20.1
1096.6	14.8	13.6	14.2	13.6	14.0	14.4	21.7
1212.0	15.9	14.7	15.2	14.6	15.0	15.5	23.3
1339.4	17.1	15.8	16.4	15.7	16.2	16.7	25.2
1480.3	18.4	17.0	17.6	16.9	17.4	18.0	27.2
1636.0	19.9	18.3	19.0	18.2	18.8	19.4	29.4
1808.0	21.4	19.8	20.5	19.7	20.3	21.0	31.8
1998.2	23.1	21.3	22.1	21.2	21.9	22.6	34.3

2208.3	25.0	23.0	23.8	22.9	23.6	24.5	37.2
2440.6	27.0	24.9	25.8	24.8	25.5	26.5	40.2
2697.3	29.2	26.9	27.8	26.8	27.6	28.6	43.6
2981.0	31.6	29.2	30.1	29.0	29.9	31.0	47.2
3294.5	34.3	31.6	32.6	31.4	32.4	33.6	51.2
3640.9	37.1	34.2	35.3	34.0	35.1	36.4	55.6
4023.9	40.3	37.1	38.3	36.8	38.0	39.5	60.3
4447.1	43.7	40.2	41.5	39.9	41.2	42.8	65.5
4914.8	47.4	43.6	45.0	43.3	44.7	46.4	71.1
5431.7	51.4	47.4	48.9	47.0	48.6	50.4	77.3
6002.9	55.9	51.5	53.1	51.1	52.7	54.8	84.0
6634.2	60.7	55.9	57.6	55.5	57.3	59.5	91.4
7332.0	65.9	60.7	62.6	60.3	62.2	64.7	99.4
8103.1	71.6	66.0	68.0	65.5	67.6	70.3	108.1
8955.3	77.9	71.8	74.0	71.2	73.6	76.5	117.7
9897.1	84.7	78.0	80.4	77.4	80.0	83.2	128.1
10938.0	92.2	84.9	87.5	84.2	87.0	90.5	139.5
12088.4	100.3	92.4	95.2	91.6	94.7	98.5	152.0
13359.7	109.2	100.6	103.6	99.7	103.1	107.3	165.5
14764.8	118.9	109.5	112.8	108.6	112.2	116.8	180.4
16317.6	129.5	119.2	122.8	118.3	122.2	127.2	196.6
18033.7	141.0	129.9	133.7	128.8	133.2	138.6	214.3
19930.4	153.7	141.5	145.7	140.3	145.1	151.0	233.7
22026.5	167.5	154.2	158.8	152.9	158.1	164.6	254.9
24343.0	182.6	168.1	173.1	166.7	172.4	179.5	278.0
26903.2	199.1	183.3	188.7	181.8	187.9	195.7	303.3
29732.6	217.1	199.9	205.7	198.2	205.0	213.4	331.0

Table 5. Values of the parameters β, γ, C, and D found in the fits of Eq. (7) to the calculated IMFPs for each elemental solid, values of β_{opt} calculated from Eq. (9), and values of *RMS* calculated from Eq. (8).

Element	β_{opt} (eV^{-1} Å^{-1})	β (eV^{-1} Å^{-1})	γ (eV^{-1})	C (Å^{-1})	D (eV Å^{-1})	*RMS* (%)
Li	0.0646	0.0653	0.4340	3.091	81.4	0.16
Be	0.0279	0.0290	0.1668	1.591	31.2	0.35
C (graphite)	0.0177	0.0183	0.1333	1.365	23.6	0.20
C (diamond)	0.0135	0.0139	0.1022	1.271	24.9	0.27
C (glassy)	0.0147	0.0153	0.1380	1.072	23.3	0.28
Na	0.1236	0.1258	0.3030	7.846	268.1	0.24
Mg	0.0618	0.0642	0.1648	3.801	126.5	0.49
Al	0.0367	0.0389	0.1258	1.629	50.3	0.61
Si	0.0291	0.0311	0.1186	1.104	30.3	0.63
K	0.1726	0.1759	0.3041	5.119	2.1	0.33
Sc	0.0604	0.0603	0.1587	5.393	119.5	0.42
Ti	0.0378	0.0380	0.1352	3.436	88.3	0.33
V	0.0256	0.0263	0.0942	2.361	73.5	0.51
Cr	0.0196	0.0204	0.0860	1.492	43.0	0.45
Fe	0.0142	0.0151	0.0715	0.981	33.7	0.72
Co	0.0140	0.0149	0.0623	1.186	40.9	0.94
Ni	0.0123	0.0132	0.0587	0.965	34.6	0.92
Cu	0.0108	0.0117	0.0535	0.680	25.8	0.94
Ge	0.0409	0.0444	0.0781	1.592	61.4	0.74
Y	0.0685	0.0708	0.1161	3.261	43.1	0.63
Nb	0.0315	0.0324	0.0811	2.494	69.8	0.60
Mo	0.0274	0.0283	0.0771	2.000	52.0	0.53
Ru	0.0208	0.0214	0.0743	1.740	48.4	0.42
Rh	0.0198	0.0204	0.0732	1.760	51.8	0.42
Pd	0.0184	0.0188	0.0787	1.733	50.5	0.44
Ag	0.0188	0.0196	0.0628	1.933	65.0	0.65
In	0.0672	0.0693	0.0911	5.607	191.8	0.47
Sn	0.0485	0.0505	0.0752	4.016	145.9	0.73
Cs	0.2960	0.3045	0.2512	9.227	247.1	0.16
Gd	0.0279	0.0292	0.0909	1.199	26.9	0.35
Tb	0.0327	0.0337	0.0979	2.236	56.6	0.26
Dy	0.0311	0.0323	0.0846	2.049	55.8	0.29
Hf	0.0529	0.0566	0.0523	3.038	111.4	0.45
Ta	0.0428	0.0460	0.0488	2.378	87.4	0.54
W	0.0342	0.0372	0.0417	1.543	55.6	0.65
Re	0.0296	0.0321	0.0428	1.502	50.6	0.54
Os	0.0241	0.0262	0.0395	1.160	42.6	0.54
Ir	0.0223	0.0241	0.0422	1.132	38.9	0.42
Pt	0.0207	0.0223	0.0444	1.046	35.4	0.38
Au	0.0202	0.0213	0.0524	1.424	48.1	0.31
Bi	0.0576	0.0609	0.0700	3.998	146.3	0.49

Table 6. Root-mean-square (RMS) deviations between IMFPs from the TPP-2M equation [Eqs. (7) and (13)] and IMFPs calculated from optical data for the indicated elemental solids and for energies between 50 eV and 30 keV.

Element	RMS deviation (%)
Li	14.7
Be	23.7
C (graphite)	47.9
C (diamond)	71.7
C (glassy)	1.6
Na	4.6
Mg	9.0
Al	11.4
Si	3.0
K	2.1
Sc	24.8
Ti	20.6
V	8.2
Cr	5.8
Fe	2.6
Co	6.7
Ni	7.2
Cu	11.9
Ge	5.6
Y	14.3
Nb	2.9
Mo	6.6
Ru	4.3
Rh	6.2
Pd	4.4
Ag	8.2
In	20.6
Sn	4.9
Cs	36.7
Gd	6.6
Tb	11.4
Dy	5.3
Hf	12.9
Ta	17.0
W	8.8
Re	6.3
Os	6.6
Ir	6.6
Pt	9.1
Au	9.4
Bi	13.6

Figure captions

Fig. 1. Plots of Z_{eff} from Eq. (5) (solid line) and P_{eff} from Eq. (6) (short-dashed line) as a function of $\Delta E_{\max}$ for aluminum.

Fig. 2. Plots of Z_{eff} from Eq. (5) (solid line) and P_{eff} from Eq. (6) (short-dashed line) as a function of $\Delta E_{\max}$ for bismuth.

Fig. 3. Plot of errors of KK- sum rule [Eq. (6)] versus errors of f-sum rule [Eq. (5)] for the 41 elemental solids.

Fig. 4. Plots of electron inelastic mean free paths as a function of electron energy for Li, Be, graphite, diamond, glassy carbon and Na. The solid circles show calculated IMFPs from the Penn algorithm (Table 4). The solid lines show fits to these IMFPs with the modified Bethe equation [Eq. (7)] and the derived parameters in Table 5. The long-dashed lines indicate IMFPs calculated from the TPP-2M equation [Eqs. (7) and (13)]. The ordinate scale on the right indicates the IMFP scale for Li. Successive plots have been displaced vertically for clarity, and the ordinate scale at the left indicates these displacements.

Fig. 5. Plots of electron inelastic mean free paths as a function of electron energy for Mg, Al, Si, K, Sc and Ti. See caption to Fig. 4.

Fig. 6. Plots of electron inelastic mean free paths as a function of electron energy for V, Cr, Fe, Co, Ni, and Cu. See caption to Fig. 4.

Fig. 7. Plots of electron inelastic mean free paths as a function of electron energy for Ge, Y, Nb, Mo and Ru. See caption to Fig. 4.

Fig. 8. Plots of electron inelastic mean free paths as a function of electron energy for Rh, Pd, Ag, In, Sn and Cs. See caption to Fig. 4.

Fig. 9. Plots of electron inelastic mean free paths as a function of electron energy for Gd, Tb, Dy, Hf, Ta and W. See caption to Fig. 4.

Fig. 10. Plots of electron inelastic mean free paths as a function of electron energy for Re, Os, Ir, Pt, Au and Bi. See caption to Fig. 4.

Fig. 11. Plots of the ratio of the IMFPs in Table 4 for Ti, V, Cr, Fe, Cu Y, Nb, Mo, Ru, Rh, Pd, Hf, Ta, W, Re, Os, Ir, and Au with the newer ELFs that we used (λ_{new}) to the corresponding IMFPs that we published previously (λ_{old}) in Ref. 4.

Fig. 12. Plots of slopes of Fano plots for Li, Ni and Si from Eqs. (10)-(12) as a function of the upper energy limit, $\Delta E_{\max}$, used in the evaluation of $E_p^2\beta_{opt}$ from Eq. (9) or of electron energy E_i. The dashed lines indicate values of the slopes calculated from Eq. (10). The solid diamonds indicate slopes calculated from the optical IMFPs (Table 4) using Eq. (11). The solid lines show slopes calculated from Eq. (12) with parameter values from Table 5 for each elemental solid. The discontinuities in the vicinity of 300 eV are artifacts associated with use of the FPA for energies between 10 eV and 300 eV and the SPA for energies between 330 eV and 30 keV.

Fig. 13. Plots of slopes of Fano plots for Ag and Pt. See caption to Fig. 12.

Fig. 14. Ratio of IMFPs calculated from the TPP-2M equation [Eqs. (7) and (13)] to IMFPs calculated from optical data as a function of electron energy for the 41 elemental solids.

Fig. 15. Comparison of IMFPs calculated from optical data for Al by Mao *et al*. (solid line, Refs. 48 and 49) with our IMFPs that were obtained with the single-pole approximation [solid circles and dashed line, TPP (SPA)] and the full Penn algorithm [solid squares, TPP (FPA)].

Fig. 16. Comparison of IMFPs calculated from optical data for Cu by Mao *et al*. (solid line, Refs. 48 and 49) with our IMFPs that were obtained with the single-pole approximation [solid circles and dashed line, TPP (SPA)] and the full Penn algorithm [solid squares, TPP (FPA)].

Fig. 17. Comparison of IMFPs calculated from optical data for Al by Denton *et al*. (solid line, Ref. 38) with our IMFPs that were obtained with the single-pole approximation [solid circles and dashed line, TPP (SPA)] and the full Penn algorithm [solid squares, TPP (FPA)].

Fig. 18. Comparison of IMFPs calculated from optical data for Au by Denton *et al*. (solid line, Ref. 38) with our IMFPs that were obtained with the single-pole approximation [solid circles and dashed line, TPP (SPA)] and the full Penn algorithm [solid squares, TPP (FPA)].

Fig. 19. Comparison of Fano plots for graphite with E/λ plotted as a function of electron energy. The solid circles are values of E/λ with IMFPs from our optical IMFPs. The solid line indicates values of E/λ with IMFPs calculated from the TPP-2M equation [Eqs. (7) and (13)]. The dashed and dotted lines show E/λ values from IMFPs calculated with Eq. (14) using parameters obtained from the EPES experiments of Tanuma *et al*. (Ref. 47) and Werner *et al*. (Refs. 83 and 84), respectively.

Fig. 20. Comparison of Fano plots for silicon with E/λ plotted as a function of electron energy. See caption to Fig. 18.

Fig. 21. Comparison of Fano plots for iron with E/λ plotted as a function of electron energy. See caption to Fig. 18.

Fig.22. Comparison of Fano plots for silver with E/λ plotted as a function of electron energy.

See caption to Fig. 18.

Fig. 23. Comparison of Fano plots for gold with E/λ plotted as a function of electron energy. See caption to Fig. 18.

Fig. 24. Plot of β_{EPES} values from the EPES experiments of Tanuma *et al*. (Ref. 47, solid circles) and Werner *et al*. (Refs. 83 and 84, solid squares) versus values of β_{TPP} from Eq. (15) (evaluated with parameter values from Table 5 and for an energy of 1 keV) for the elemental solids common to our calculations and each set of EPES measurements.

Fig. 25. Summary plot of calculated IMFPs for the 41 elemental solids (Table 4) as a function of electron energy.

References

[1] C. J. Powell, A. Jablonski, *Nucl. Instr. Methods Phys. Res. A*. **2009**, 54, 601.

[2] C. J. Powell, A. Jablonski A, *J. Electron Spectrosc. Relat. Phenom.* (in press).

[3] S. Tanuma, C. J. Powell, D. R. Penn, *Surf. Interface Anal.* **1988**, 11, 577.

[4] S. Tanuma, C. J. Powell, D. R. Penn, *Surf. Interface Anal.* **1991**, 17, 911.

[5] S. Tanuma, C. J. Powell, D. R. Penn, *Surf. Interface Anal.* **1991**, 17, 929.

[6] S. Tanuma, C. J. Powell, D. R. Penn, *Surf. Interface Anal.* **1993**, 20, 77.

[7] S. Tanuma, C. J. Powell, D. R. Penn, *Surf. Interface Anal.* **1994**, 21, 165.

[8] S. Tanuma, C. J. Powell, D. R. Penn, *Surf. Interface Anal.* **1997**, 25, 25.

[9] S. Tanuma, C. J. Powell, D. R. Penn, *Surf. Interface Anal.* **2003**, 35, 268.

[10] S. Tanuma, C. J. Powell, D. R. Penn, *Surf. Interface Anal*. **2005**, 37, 1.

[11] S. Tanuma, C. J. Powell, D. R. Penn, *J. Electron Spectrosc. Relat. Phenom.* **1993**, 62, 95.

[12] H. Bethe, *Ann. Phys.* **1930**, 5, 325.

[13] C. S. Fadley, *Nucl. Instr. Methods Phys. Res. A.* **2005**, 24, 547.

[14] W. S. M. Werner, L. Kover, J. Toth, D. Varga, *J. Electron Spectrosc. Relat. Phenom.* **2002**, 103, 122.

[15] G. Beamson, N. Moslemzadeh, P. Weightman, J. F. Watts, *J. Electron Spectrosc. Relat. Phenom.* **2008**, 19, 162.

[16] C. J. Powell, A. Jablonski, *J. Phys. Chem. Ref. Data.* **1999**, 19, 28.

[17] G. Gergely, *Prog. Surf. Sci.* **2002**, 31, 71.

[18] D. R. Penn, *Phys. Rev. B* **1987**, 35, 482.

[19] D. R. Penn, *Phys. Rev. B* **1976**, 13, 5248.

[20] J. Lindhard, *K. Dan. Vidensk. Selsk. Mat.-Fys. Medd.* **1954**, 28(8), 1.

[21] H.-J. Hagemann, W. Gudat, C. Kunz, Deutsches Elektronen-Synchrotron Report SR-74/7, Hamburg (1974), unpublished; H.–J. Hagemann, W. Gudat, C. Kunz, *J. Opt. Soc. Am.* **1975**, 65, 742.

[22] B. L. Henke, J. C. Davis, E. M. Gullikson, R. C. C. Perera, Lawrence Berkeley Laboratory Report 26259, 1988; B. L. Henke, E. M. Gullikson, J. C. Davis, *At. Data Nucl. Data Tables* **1993**, 54, 181.

[23] E. D. Palik (ed.), *Handbook of Optical Constants of Solids*, Academic Press: New York, 1985.

[24] E. D. Palik (ed.), *Handbook of Optical Constants of Solids III*, Academic Press: New York, 1998.

[25] Y. A. Uspenskii, J. F. Seely, N. L. Popov, A. V. Vinogradov, Y. P. Pershin, V. V. Kondratenko, *J. Opt. Soc. Am. A* **2004**, 21, 298.

[26] J. H. Weaver, C. Krafka, D. W. Lynch, E. E. Koch, *Optical Properties of Metals*, Physik Daten, Nos. 18-1 and 18-2, Fachinformationszentrum, Karlsruhe (1981).

[27] W. S. M. Werner, K. Glantschnig, C. Ambrosch-Draxl, *J. Phys. Chem. Ref. Data* **2009**, 38, 1013.

[28] B. L. Henke, P. Lee, T. J. Tanaka, R. L. Shimabukuro, B. K. Fujikawa, *Low Energy X-ray Diagnostics*, Amer. Inst. Phys. Conf. Proc. No. 75, American Institute of Physics, New York, 1981.

[29] B. L. Henke, P. Lee, T. J. Tanaka, R. L. Shimabukuro, B. K. Fujikawa, *At. Data Nucl. Data Tables* **1982**, 27,1.

[30] E. D. Palik (ed.), *Handbook of Optical Constants of Solids II*, Academic Press: New York, 1991.

[31] B. Brousseau-Lahaye, C. Colliex, J. Frandon, M. Casgnier, P. Trebbia, Phys. Stat. Sol. (b) **1975**, 69, 257.

[32] J. L. Robins, J. B. Swan, Proc. Phys. Soc. (London) **1960**, 76, 857.

[33] M. J. Lynch, J. B. Swan, Aust. J. Phys. **1968**, 21, 811.

[34] C. Wehenkel, B. Gauthe, Phys. Stat. Sol. (b) **1974**, 64, 515.

[35] M. Cukier, B. Gauthe, C. Wehenkel, J. Physique **1980**, 41, 603.

[36] J. Daniels, C. v. Festenberg, H. Raether, K. Zeppenfeld, *Springer Tracts in Modern Physics* **1970**, 54, 77.

[37] W. De la Cruz, F. Yubero, Surf. Interface Anal. **2007**, 39, 460.

[38] C. D. Denton, I. Abril, R. Garcia-Molina, J. C. Moreno-Marin, S. Heredia-Avalos, *Surf. Interface Anal.* **2008**, 40, 1481.

[39] D. Emfietzoglou, I. Kyriakou, I. Abril, R. Garcia-Molina, I. D. Petsalakis, H. Nikjoo, A. Pathak, *Nucl. Instr. Methods Phys. Res. B* **2009**, 267, 45.

[40] S. Tanuma, C. J. Powell, D. R. Penn, *J. Electron Spectrosc. Relat. Phenom*. **1990**, 52, 285.

[41] M. Inokuti, *Rev. Mod. Phys.* **1971**, 43, 297.

[42] C. J. Powell, *Surf. Interface Anal*. **1987**, 10, 349.

[43] U. Fano, *Phys. Rev.* **1954**, 95, 1198.

[44] J. Zemek, J. Potmesil, M. Vanecek, B. Lesiak, A. Jablonski, *Appl. Phys. Letters* **2005**, 87, 262114.

[45] J. J. Rehr, (private communication); http://leonardo.phys.washington.edu/feff/loss (accessed April 30, 2009).

[46] C. Kunz, B. C. C. Cowie, W. Drube, T.-L. Lee, S. Thiess, C. Wild, J. Zegenhagen, *J. Electron Spectrosc. Relat. Phenom.* **2009**, 173, 29.

[47] S. Tanuma, T. Shiratori, T. Kimura, K. Goto, S. Ichimura, C. J. Powell, *Surf. Interface Anal.* **2005**, 37, 833.

[48] S. F. Mao,Y. G. Li, R. G. Zeng, Z. J. Ding, *J. Appl. Phys*. **2008**, 104, 114907.

[49] S. F. Mao, Y. G. Li, R. G. Zeng, Z. J. Ding, *J. Appl. Phys*. **2009**, 105, 099902.

[50] K. O. Jensen, A. B. Walker, *Surf. Sci.* **1993**, 292, 83.

[51] N. D. Mermin, *Phys. Rev. B* **1970**, 1, 2362.

[52] C. D. Denton and I. Abril (private communication).

[53] Z. J. Ding, R. Shimizu, *Surf. Sci*. **1989**, 222, 313.

[54] Z. J. Ding, R. Shimizu, *Scanning* **1996**, 18, 92.

[55] Z. J. Ding (private communication).

[56] F. Yubero (private communication).

[57] J. Hubbard, *Proc. Roy. Soc. London A* **1958**, 243, 336.

[58] D. J. W. Geldart, S. H. Vosko, *Can. J. Phys.* **1966**, 44, 2137.

[59] T. M. Rice, *Annals of Phys.* **1965**, 31, 100.

[60] L. Kleinman, *Phys. Rev.* **1967**, 160, 585.

[61] D. C. Langreth, *Phys. Rev.* **1969**, 181, 753.

[62] M. Corradini, R. Del Sole, G. Onida, M. Palumno, *Phys. Rev. B* **1998**, 57, 14569.

[63] D. Emfietzoglou (private communication).

[64] Z. Tan, Y. Xia, M. Zhao, X. Liu, F. Li, B. Huang, Y. Ji, *Nucl. Instr. Methods Phys. Res. B* **2004**, 222, 27.

[65] J. C. Ashley, V. E. Anderson, *J. Electron Spectrosc. Relat. Phenom*. **1981**, 24, 127.

[66] J. M. Fernandez-Varea, R. Mayol, D. Liljequist, F. Salvat, *J. Phys.: Condensed Matter* **1993**, 5, 3593.

[67] J. M. Fernandez-Varea, D. Liljequist, S. Csillag, R. Räty, F. Salvat, *Nucl. Instr. Methods Phys. Res. B* **1996**, 108, 35.

[68] J. S. Dolado, V. M. Silkin, M. A. Cazalilla, A. Rubio, P. M. Echenique, *Phys. Rev. B* **2001**, 64, 195128.

[69] V. M. Silkin, E. V. Chulkov, P. M. Echenique, *Phys. Rev. B* **2003**, 68, 205106.

[70] V. P. Zhukov, E. V. Chulkov, P. M. Echenique, *Phys. Rev. B* **2006**, 73, 125105.

[71] P. M. Echenique, J. M. Pitarke, E. V. Chulkov, A. Rubio, *Chemical Physics* **2000**, 251, 1.

[72] E. V. Chulkov, A. G. Borisov, J. P. Gauyacq, D. Sanchez-Portal, V. M. Silkin, V. P. Zhukov, P. M. Echenique, *Chemical Reviews* **2006**, 106, 4160.

[73] N. V. Smith, G. K. Wertheim, A. B. Andrews, C.-T. Chen, *Surf. Sci. Letters* **1993**, 282, L359.

[74] L. I. Johansson, B. E. Sernelius, *Phys. Rev. B* **1994**, 50, 16817.

[75] T.-W. Pi, I.-H. Hong, C.-P. Cheng, G. K. Wertheim, *J. Electron Spectrosc. Relat. Phenom.* **2000**, 107, 163.

[76] N. E. Maddocks, R. W. Godby, R. J. Needs, *Europhysics Letters* **1994**, 27, 681.

[77] N. E. Maddocks, R. W. Godby, R. J. Needs, *Phys. Rev. B* **1994**, 49, 8502.

[78] M. Ehrnsperger, H. Bross, *J. Phys.: Condens. Matter* **1997**, 9, 1225.

[79] S. Waidman, M. Knupfer, B. Arnold, J. Fink, A. Fleszar, W. Hanke, Phys. Rev. B 2000, 61, 10149.

[80] A. G. Marinopoulos, L. Reining, V. Olevano, A. Rubio, T. Pichler, X. Liu, M. Knupfer, J. Fink, *Phys. Rev. Letters* **2002**, 89, 076402.

[81] I. G. Gurtubay, J. M. Pitarke, W. Ku, A. G. Eguiluz, B. C. Larson, J. Tischler, P. Zschack, K. D. Finkelstein, *Phys. Rev. B* **2005**, 72, 125117.

[82] H.-C. Weissker, J. Serrano, S. Huotari, F. Bruneval, F. Sottile, G. Monaco, M. Krisch, V. Olevano, L. Reining, *Phys. Rev. Letters* **2006**, 97, 237602.

[83] W. S. M. Werner, C. Tomastik, T. Cabela, G. Richter, H. Störi, *Surf. Sci.* **2000**, 470, L123.

[84] W. S. M. Werner, C. Tomastik, T. Cabela, G. Richter, H. Störi, *J. Electron Spectrosc. Relat. Phenom.* **2001**, 113, 127.

[85] H. Venghaus, *Phys. Stat. Solidi B* **1975**, 71, 609.

[86] A. Jablonski, F. Salvat, C. J. Powell, *J. Phys. Chem. Ref. Data* **2004**, 33, 409.

[87] D. Bote, F. Salvat, A. Jablonski, C. J. Powell, *J. Electron Spectrosc. Relat. Phenom.* **2009**, 175, 41.

[88] M. P. Seah, I. S. Gilmore, S. J. Spencer, *Surf. Interface Anal.* **2001**, 31, 778.

[89] M. P. Seah, S.J. Spencer, *Surf. Interface Anal*. **2005**, 37, 731.

[90] C. J. Powell, A. Jablonski, *J. Electron Spectrosc. Relat. Phenom.* **2001**, 114-116, 1139.

[91] A. Jablonski, C. J. Powell, *Surf. Science Reports* **2002**, 47, 33.