Table 4.4.5.1. $\langle j_0 \rangle$ *form factors for 3d transition elements and their ions*

Atom or ion	*A*	*a*	*B*	*b*	*C*	*c*	*D*	*e*
Sc	0.2512	90.030	0.3290	39.402	0.4235	14.322	−0.0043	0.2029
Sc^{+}	0.4889	51.160	0.5203	14.076	−0.0286	0.179	0.0185	0.1217
Sc^{2+}	0.5048	31.403	0.5186	10.990	−0.0241	1.183	0.0000	0.0578
Ti	0.4657	33.590	0.5490	9.879	−0.0291	0.323	0.0123	0.1088
Ti^{+}	0.5093	36.703	0.5032	10.371	−0.0263	0.311	0.0116	0.1125
Ti^{2+}	0.5091	24.976	0.5162	8.757	−0.0281	0.916	0.0015	0.0589
Ti^{3+}	0.3571	22.841	0.6688	8.931	−0.0354	0.483	0.0099	0.0575
V	0.4086	28.811	0.6077	8.544	−0.0295	0.277	0.0123	0.0970
V^{+}	0.4444	32.648	0.5683	9.097	−0.2285	0.022	0.2150	0.1111
V^{2+}	0.4085	23.853	0.6091	8.246	−0.1676	0.041	0.1496	0.0593
V^{3+}	0.3598	19.336	0.6632	7.617	−0.3064	0.030	0.2835	0.0515
V^{4+}	0.3106	16.816	0.7198	7.049	−0.0521	0.302	0.0221	0.0433
Cr	0.1135	45.199	0.3481	19.493	0.5477	7.354	−0.0092	0.1975
Cr^{+}	−0.0977	0.047	0.4544	26.005	0.5579	7.489	0.0831	0.1114
Cr^{2+}	1.2024	−0.005	0.4158	20.548	0.6032	6.956	−1.2218	0.0572
Cr^{3+}	−0.3094	0.027	0.3680	17.035	0.6559	6.524	0.2856	0.0436
Cr^{4+}	−0.2320	0.043	0.3101	14.952	0.7182	6.173	0.2042	0.0419
Mn	0.2438	24.963	0.1472	15.673	0.6189	6.540	−0.0105	0.1748
Mn^{+}	−0.0138	0.421	0.4231	24.668	0.5905	6.655	−0.0010	0.1242
Mn^{2+}	0.4220	17.684	0.5948	6.0050	0.0043	−0.609	−0.0219	0.0589
Mn^{3+}	0.4198	14.283	0.6054	5.469	0.9241	−0.009	−0.9498	0.0392
Mn^{4+}	0.3760	12.566	0.6602	5.133	−0.0372	0.563	0.0011	0.0393
Fe	0.0706	35.008	0.3589	15.358	0.5819	5.561	−0.0114	0.1398
Fe^{+}	0.1251	34.963	0.3629	15.514	0.5223	5.591	−0.0105	0.1301
Fe^{2+}	0.0263	34.960	0.3668	15.943	0.6188	5.594	−0.0119	0.1437
Fe^{3+}	0.3972	13.244	0.6295	4.903	−0.0314	0.350	0.0044	0.0441
Fe^{4+}	0.3782	11.380	0.6556	4.592	−0.0346	0.483	0.0005	0.0362
Co	0.4139	16.162	0.6013	4.780	−0.1518	0.021	0.1345	0.1033
Co^{+}	0.0990	33.125	0.3645	15.177	0.5470	5.008	−0.0109	0.0983
Co^{2+}	0.4332	14.355	0.5857	4.608	−0.0382	0.134	0.0179	0.0711
Co^{3+}	0.3902	12.508	0.6324	4.457	−0.1500	0.034	0.1272	0.0515
Co^{4+}	0.3515	10.778	0.6778	4.234	−0.0389	0.241	0.0098	0.0390
Ni	−0.0172	35.739	0.3174	14.269	0.7136	4.566	−0.0143	0.1072
Ni^{+}	0.0705	35.856	0.3984	13.804	0.5427	4.397	−0.0118	0.0738
Ni^{2+}	0.0163	35.883	0.3916	13.223	0.6052	4.339	−0.0133	0.0817
Ni^{3+}	0.0012	35.000	0.3468	11.987	0.6667	4.252	−0.0148	0.0883
Ni^{4+}	−0.0090	35.861	0.2776	11.790	0.7474	4.201	−0.0163	0.0966
Cu	0.0909	34.984	0.4088	11.443	0.5128	3.825	−0.0124	0.0513
Cu^{+}	0.0749	34.966	0.4147	11.764	0.5238	3.850	−0.0127	0.0591
Cu^{2+}	0.0232	34.969	0.4023	11.564	0.5882	3.843	−0.0137	0.0532
Cu^{3+}	0.0031	34.907	0.3582	10.914	0.6531	3.828	−0.0147	0.0665
Cu^{4+}	−0.0132	30.682	0.2801	11.163	0.7490	3.817	−0.0165	0.0767

compute from them a consistent set of bound scattering cross sections. In the present version, we have used the values of the coherent and incoherent scattering lengths recommended by Koester, Rauch & Seymann (1991), supplemented with a few more recently measured values, and have computed from them the corresponding scattering cross sections. The trailing digits in parentheses give the standard errors calculated from the errors in the input data using the statistical theory of error propagation (Young, 1962). The imaginary parts of the scattering lengths, which are appreciable only for strongly absorbing nuclides, were calculated from the measured absorption cross sections (Mughabghab, Divadeenam & Holden, 1981; Mughabghab, 1984) and are listed beneath the real parts of Table 4.4.4.1.

In a few cases, where the scattering lengths have not yet been measured directly, the available scattering cross-section data (Mughabghab, Divadeenam & Holden, 1981; Mughabghab, 1984) were used to obtain the scattering lengths. Equations (4.4.4.11), (4.4.4.12), and (4.4.4.13) were used, where necessary, to fill gaps in Table 4.4.4.1. For some elements, these relations indicated inconsistencies in the data. In such cases, appropriate adjustments in the values of some of the quantities were made. In almost all cases, such adjustments were comparable with the stated errors. Finally, for some elements, it was necessary to estimate arbitrarily the scattering lengths of one or two isotopes in order to be able to complete the table. Such estimates are indicated by the letter '*E*' and were usually made only for isotopes of low natural abundance where the estimated values have only a marginal effect on the final results. Apart from the inclusion of new data for Ti and Mn, the values listed in Table 4.4.4.1 are the same as in Sears (1992*b*).

4.4.5. Magnetic form factors (By P. J. Brown)

The form factors used in the calculations of the cross sections for magnetic scattering of neutrons are defined in Subsection 6.1.2.3 as

$$\langle j_l(k) \rangle = \int\limits_0^\infty U^2(r) j_l(kr) 4\pi r^2 \,\mathrm{d}r, \qquad (4.4.5.1)$$

references