Erratum: Electron scattering from H_2O: Elastic scattering [Phys. Rev. A 78, 052710 (2008)]

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Previously, we published measurements, obtained with a variation of the relative flow technique that employed a collimating thin aperture gas source, of the differential cross sections (DCSs) for elastic scattering of electrons by water. Our setup used crossed electron and gas beams as part of a high-resolution electron spectrometer. The use of an aperture (as opposed to a tube) gas source means that the gas-kinetic cross section, otherwise essential for correct normalization of the DCS, was not a parameter in our experiment. We noted then that our measurements were some 30%–50% larger than previous experimental values, and we hypothesized that this difference was perhaps due to inadequate characterization of the gas-kinetic cross section for water, inasmuch as this parameter was needed for applying the relative flow method in all measurements except ours.

Recently, we revisited this problem with new personnel as well as a minor change in the scattered electron detector (replacement of real with virtual entrance apertures). In the process of measuring relative flow rates as well as elastic-scattering differential cross sections (DCSs), we found our previously reported DCSs to be too large by, on average, 15% compared to the present results since the new relative flow measurements were higher than the earlier flow rates by about this amount. We note here that the new flow-rate measurements consisted of more data points and were checked several times to improve reliability. We, therefore, revise our previous DCSs and provide corrected values in Table III. The revised data are, on average, 15% smaller than our previous results. These revised results consist mainly of new measurements taken in the 60°–120° scattering angle range with a renormalization of the earlier measurements to the new DCSs throughout the entire angular range. Although this revision improves the agreement with past measurements, our results remain systematically larger by about 20%. However, the difference is now generally within the combined error limits. Consequently, although we still note a possible effect of error in the gas-kinetic cross section for water on the normalization of past cross-sectional measurements, any such effect is smaller than was suggested by our previous study.

We also correct the description of the basis set used in the calculation by noting that the most diffuse s-type Gaussian on oxygen was inadvertently replaced by a d-type Gaussian of the same exponent.

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TABLE III. Revised experimental DCSs for vibrationally elastic scattering of electrons from H_2O with 1 standard deviation error bars. Integral cross sections (ICSs) and momentum-transfer cross section (MTCS) were obtained using Born-dipole extrapolation of DCSs at small angles. DCSs are in units of 10^{-16} cm^2/sr while ICSs and MTCSs are in units of 10^{-16} cm^2.

	1 eV		2 eV		4 eV		6 eV		8 eV		10 eV		15 eV		20 eV		30 eV		50 eV		100 eV	
	DCS	Error	DCS	Error	DCS	Error	DCS	Error	DCS	Error	DCS	Error	DCS	Error	DCS	Error	DCS	Error	DCS	Error	DCS	Error
5																	25.5	3.8	31.3	6.2	14.6	2.1
10							15.4	2.1	13.67	1.9	12.3	2	11	1.6	14.5	2.1	12.7	2	13.1	1.9	9.66	1.26
15	29.9	5.9	21.6	5.5	11.8	2	9.05	1.1	8.486	1.08	8.08	1.21	7.64	1.08	9.83	1.33						
20	19.6	2.1	12.1	2.3	7.17	1.43	6.17	0.81	5.930	0.83	5.9	0.81	5.88	0.75	6.93	0.85	5.55	0.67	5.05	0.704	2.875	0.351
30	9.81	1.35	5.54	0.99	3.75	0.62	3.28	0.39	3.263	0.44	3.35	0.41	3.69	0.51	3.96	0.51	2.68	0.34	1.96	0.24	0.817	0.102
40	6.24	0.72	3.14	0.56	2.22	0.38	2.05	0.24	2.120	0.27	2.19	0.27	2.33	0.29	2.11	0.26	1.39	0.17	0.91	0.117	0.353	0.041
50	3.79	0.48	1.91	0.32	1.47	0.25	1.47	0.19	1.478	0.18	1.59	0.2	1.52	0.19	1.25	0.14	0.77	0.09	0.46	0.063	0.191	0.025
60							1.15	0.15	1.103	0.15	1.07	0.14	1.06	0.15	0.69	0.1	0.44	0.06	0.29	0.031	0.114	0.016
70	1.92	0.22	0.958	0.19	0.884	0.147	1.05	0.13	1.043	0.12	1.01	0.12	0.814	0.101	0.573	0.067	0.32	0.039	0.197	0.023	0.066	0.01
90	1.31	0.17	0.58	0.092	0.618	0.093	0.811	0.105	0.833	0.103	0.799	0.099	0.621	0.074	0.382	0.052	0.204	0.026	0.101	0.012	0.024	0.005
110	1.15	0.13	0.413	0.067	0.397	0.058	0.548	0.068	0.569	0.072	0.572	0.07	0.491	0.057	0.332	0.043	0.186	0.024	0.112	0.015	0.058	0.009
130	1.12	0.2	0.401	0.07	0.35	0.063	0.526	0.064	0.6264	0.082	0.698	0.091	0.739	0.094	0.547	0.068	0.353	0.044	0.288	0.037	0.13	0.016
ICS	118	18	65.8	9.9	39.8	6.0	32.7	4.9	29.2	4.3	27.0	4.1	23.1	3.5	20.3	3.1	14.5	2.2	11.1	1.7	5.91	0.89
MTCS	19.2	2.9	10.1	1.5	6.84	1.0	8.16	1.2	8.65	1.3	8.94	1.1	8.28	1.2	6.13	0.92	4.00	0.60	3.01	0.45	1.35	0.23