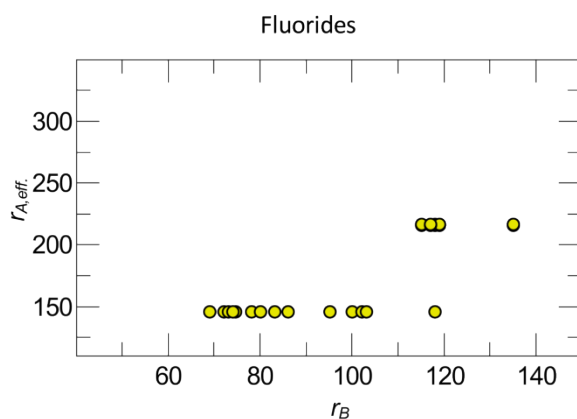


SUPPORTING INFORMATION

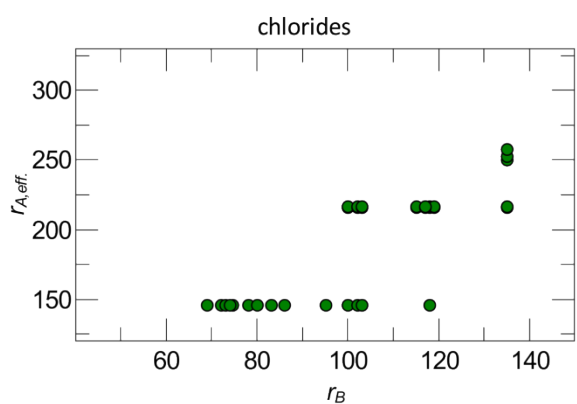
An Extended Tolerance Factor Approach for Organic-Inorganic Perovskites

Gregor Kieslich, Shijing Sun and Anthony K. Cheetham*

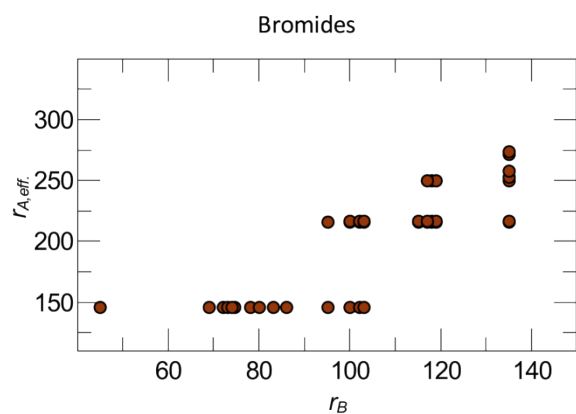
Department of Materials Science and Metallurgy, University of Cambridge, 27 Charles
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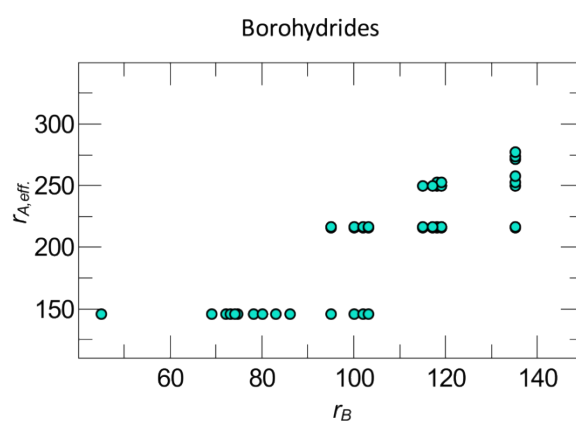
SI-Figure 1. Plotted are the effective radii of protonated amines $r_{A,eff}$. vs ionic radii of the divalent metals r_B of potentially existing fluorides.



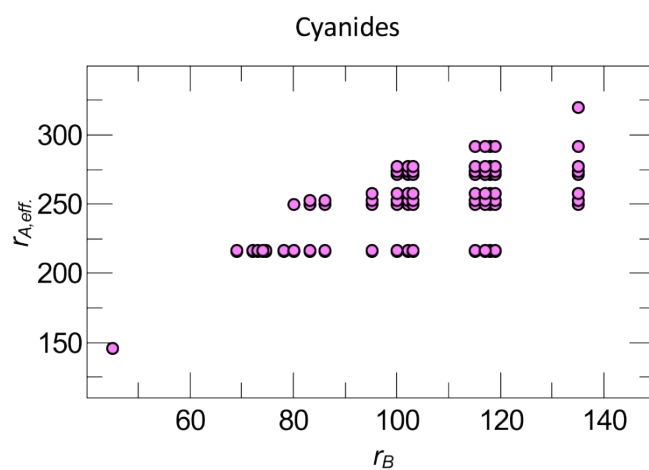
SI-Figure 2. Plotted are the effective radii of protonated amines $r_{A,eff}$. vs ionic radii of the divalent metals r_B of potentially existing chlorides.



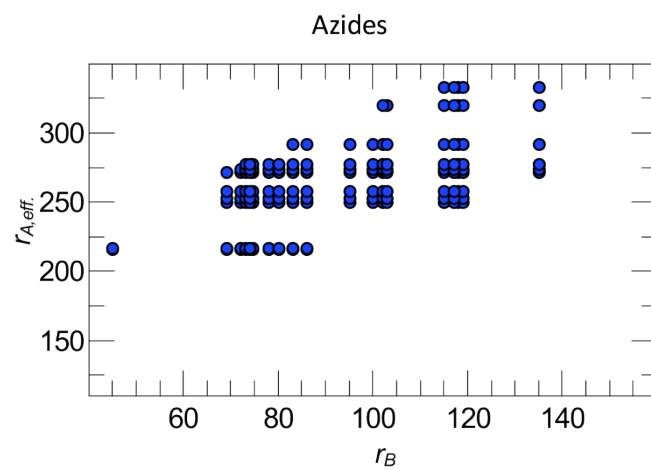
SI-Figure 3. Plotted are the effective radii of protonated amines $r_{A,eff}$. vs ionic radii of the divalent metals r_B of potentially existing bromides.



SI-Figure 4. Plotted are the effective radii of protonated amines $r_{A,eff}$. vs ionic radii of the divalent metals r_B of potentially existing borohydrides.



SI-Figure 5. Plotted are the effective radii of protonated amines $r_{A,eff}$. vs ionic radii of the divalent metals r_B of potentially existing cyanides.



SI-Figure 6. Plotted are the effective radii of protonated amines $r_{A,eff}$ vs ionic radii of the divalent metals r_B of potentially existing azides.

SI-Table 1. Shown are Tolerance Factors of all 2352 amine-metal-anion permutations regarded in this work.

Count
TFs: **2352.000**
0.8 < TF < 1: **742.000**
0.8 < TF < 1 (organic anions): **562.000**
0.8 < TF < 1 (halides only): **180.000**

		Be	AmH-M-F	AmH-M-Cl	AmH-M-Br	AmH-M-I	AmH-M-BH4	AmH-M-HCOO	AmH-M-CN	AmH-M-N3
Ammonium	146	45	1.119	1.023	1.003	0.977	0.995	0.743	0.851	0.760
Hydroxylammonium	216	45	1.404	1.242	1.209	1.163	1.195	0.927	1.056	0.943
Methylammonium	217	45	1.408	1.245	1.212	1.166	1.198	0.930	1.058	0.945
Hydrazinium	217	45	1.408	1.245	1.212	1.166	1.198	0.930	1.058	0.945
Azetidinium	250	45	1.543	1.349	1.309	1.254	1.292	1.017	1.155	1.031
Formamidinium	253	45	1.555	1.358	1.317	1.262	1.300	1.024	1.163	1.039
Imidazolium	258	45	1.575	1.374	1.332	1.275	1.314	1.038	1.178	1.052
Dimethylammonium	272	45	1.632	1.417	1.373	1.313	1.354	1.074	1.219	1.089
Pyrrolinium	272	45	1.632	1.417	1.373	1.313	1.354	1.074	1.219	1.089
Ethylammonium	274	45	1.640	1.424	1.379	1.318	1.360	1.080	1.225	1.094
Guanidinium	278	45	1.657	1.436	1.391	1.329	1.371	1.090	1.236	1.104
Tetramethylammoium	292	45	1.714	1.480	1.432	1.366	1.411	1.127	1.277	1.141
Thiazolium	320	45	1.828	1.568	1.514	1.441	1.491	1.201	1.359	1.214
Tropylium	333	45	1.881	1.608	1.552	1.476	1.528	1.235	1.397	1.248

		Mg								
Ammonium	146	72	0.968	0.914	0.902	0.886	0.897	0.675	0.766	0.692
Hydroxylammonium	216	72	1.215	1.110	1.087	1.056	1.077	0.842	0.950	0.858
Methylammonium	217	72	1.218	1.112	1.090	1.058	1.080	0.845	0.952	0.860
Hydrazinium	217	72	1.218	1.112	1.090	1.058	1.080	0.845	0.952	0.860
Azetidinium	250	72	1.335	1.205	1.177	1.138	1.165	0.924	1.039	0.938
Formamidinium	253	72	1.345	1.213	1.185	1.145	1.173	0.931	1.047	0.945
Imidazolium	258	72	1.363	1.227	1.198	1.158	1.185	0.943	1.060	0.957
Dimethylammonium	272	72	1.412	1.266	1.235	1.191	1.221	0.976	1.097	0.990
Pyrrolinium	272	72	1.412	1.266	1.235	1.191	1.221	0.976	1.097	0.990
Ethylammonium	274	72	1.420	1.272	1.240	1.196	1.227	0.981	1.102	0.995
Guanidinium	278	72	1.434	1.283	1.251	1.206	1.237	0.991	1.112	1.004
Tetramethylammoium	292	72	1.483	1.322	1.288	1.240	1.273	1.024	1.149	1.038
Thiazolium	320	72	1.582	1.400	1.361	1.308	1.345	1.091	1.223	1.104
Tropylium	333	72	1.628	1.437	1.396	1.339	1.378	1.122	1.257	1.135

Ca

Ammonium	146	100	0.849	0.823	0.817	0.809	0.814	0.616	0.694	0.632
Hydroxylammonium	216	100	1.066	0.999	0.984	0.963	0.978	0.769	0.860	0.784
Methylammonium	217	100	1.069	1.002	0.987	0.966	0.980	0.772	0.863	0.786
Hydrazinium	217	100	1.069	1.002	0.987	0.966	0.980	0.772	0.863	0.786
Azetidinium	250	100	1.171	1.085	1.065	1.039	1.057	0.844	0.941	0.858
Formamidinium	253	100	1.181	1.092	1.073	1.045	1.064	0.850	0.948	0.864
Imidazolium	258	100	1.196	1.105	1.085	1.056	1.076	0.861	0.960	0.875
Dimethylammonium	272	100	1.239	1.140	1.118	1.087	1.109	0.892	0.994	0.905
Pyrrolinium	272	100	1.239	1.140	1.118	1.087	1.109	0.892	0.994	0.905
Ethylammonium	274	100	1.246	1.145	1.123	1.092	1.113	0.896	0.998	0.910
Guanidinium	278	100	1.258	1.155	1.132	1.100	1.123	0.905	1.008	0.918
Tetramethylammoium	292	100	1.301	1.190	1.166	1.131	1.155	0.936	1.041	0.949
Thiazolium	320	100	1.388	1.261	1.233	1.193	1.221	0.997	1.108	1.009
Tropylium	333	100	1.428	1.293	1.264	1.222	1.251	1.025	1.139	1.037

Sr

Ammonium	146	118	0.787	0.773	0.770	0.766	0.769	0.584	0.654	0.599
Hydroxylammonium	216	118	0.988	0.939	0.928	0.912	0.923	0.729	0.811	0.743
Methylammonium	217	118	0.991	0.941	0.930	0.914	0.925	0.731	0.814	0.745
Hydrazinium	217	118	0.991	0.941	0.930	0.914	0.925	0.731	0.814	0.745
Azetidinium	250	118	1.086	1.019	1.004	0.983	0.998	0.799	0.888	0.813
Formamidinium	253	118	1.094	1.026	1.011	0.990	1.004	0.805	0.894	0.819
Imidazolium	258	118	1.109	1.038	1.022	1.000	1.016	0.816	0.905	0.829
Dimethylammonium	272	118	1.149	1.071	1.054	1.029	1.046	0.845	0.937	0.858
Pyrrolinium	272	118	1.149	1.071	1.054	1.029	1.046	0.845	0.937	0.858
Ethylammonium	274	118	1.155	1.076	1.058	1.033	1.051	0.849	0.941	0.862
Guanidinium	278	118	1.166	1.085	1.067	1.042	1.060	0.857	0.950	0.870
Tetramethylammoium	292	118	1.206	1.119	1.099	1.071	1.090	0.886	0.982	0.899
Thiazolium	320	118	1.287	1.185	1.162	1.130	1.152	0.944	1.044	0.956
Tropylium	333	118	1.324	1.216	1.191	1.157	1.181	0.971	1.074	0.983

Ba

Ammonium	146	135	0.737	0.732	0.731	0.729	0.730	0.556	0.621	0.571
Hydroxylammonium	216	135	0.924	0.888	0.880	0.868	0.877	0.694	0.770	0.708
Methylammonium	217	135	0.927	0.891	0.882	0.870	0.879	0.696	0.772	0.710
Hydrazinium	217	135	0.927	0.891	0.882	0.870	0.879	0.696	0.772	0.710
Azetidinium	250	135	1.016	0.964	0.953	0.936	0.948	0.761	0.842	0.775
Formamidinium	253	135	1.024	0.971	0.959	0.942	0.954	0.767	0.849	0.780
Imidazolium	258	135	1.037	0.982	0.970	0.952	0.964	0.777	0.859	0.790

Dimethylammonium	272	135	1.075	1.014	1.000	0.980	0.994	0.805	0.889	0.818
Pyrrolinium	272	135	1.075	1.014	1.000	0.980	0.994	0.805	0.889	0.818
Ethylammonium	274	135	1.080	1.018	1.004	0.984	0.998	0.809	0.893	0.822
Guanidinium	278	135	1.091	1.027	1.013	0.992	1.006	0.817	0.902	0.829
Tetramethylammoium	292	135	1.128	1.058	1.043	1.020	1.036	0.844	0.931	0.857
Thiazolium	320	135	1.204	1.121	1.102	1.076	1.094	0.899	0.991	0.912
Tropylium	333	135	1.238	1.150	1.130	1.101	1.121	0.925	1.019	0.937

Mn

Ammonium	146	83	0.918	0.876	0.867	0.854	0.863	0.651	0.736	0.667
Hydroxylammonium	216	83	1.152	1.063	1.044	1.017	1.036	0.812	0.913	0.827
Methylammonium	217	83	1.155	1.066	1.047	1.020	1.038	0.814	0.915	0.829
Hydrazinium	217	83	1.155	1.066	1.047	1.020	1.038	0.814	0.915	0.829
Azetidinium	250	83	1.265	1.154	1.130	1.097	1.120	0.891	0.998	0.905
Formamidinium	253	83	1.275	1.162	1.138	1.104	1.127	0.897	1.006	0.912
Imidazolium	258	83	1.292	1.176	1.151	1.116	1.140	0.909	1.018	0.923
Dimethylammonium	272	83	1.339	1.213	1.186	1.148	1.174	0.941	1.054	0.955
Pyrrolinium	272	83	1.339	1.213	1.186	1.148	1.174	0.941	1.054	0.955
Ethylammonium	274	83	1.346	1.219	1.191	1.153	1.179	0.946	1.059	0.960
Guanidinium	278	83	1.359	1.229	1.201	1.162	1.189	0.955	1.069	0.969
Tetramethylammoium	292	83	1.406	1.267	1.237	1.195	1.224	0.987	1.104	1.001
Thiazolium	320	83	1.499	1.342	1.308	1.260	1.293	1.052	1.175	1.065
Tropylium	333	83	1.543	1.377	1.341	1.291	1.325	1.082	1.208	1.094

Fe

Ammonium	146	78	0.940	0.893	0.883	0.868	0.878	0.661	0.749	0.678
Hydroxylammonium	216	78	1.180	1.084	1.063	1.035	1.054	0.826	0.929	0.841
Methylammonium	217	78	1.183	1.087	1.066	1.037	1.057	0.828	0.932	0.843
Hydrazinium	217	78	1.183	1.087	1.066	1.037	1.057	0.828	0.932	0.843
Azetidinium	250	78	1.296	1.177	1.151	1.115	1.140	0.905	1.016	0.920
Formamidinium	253	78	1.306	1.185	1.159	1.122	1.147	0.912	1.024	0.927
Imidazolium	258	78	1.323	1.199	1.172	1.134	1.160	0.924	1.037	0.938
Dimethylammonium	272	78	1.371	1.237	1.208	1.167	1.195	0.957	1.073	0.971
Pyrrolinium	272	78	1.371	1.237	1.208	1.167	1.195	0.957	1.073	0.971
Ethylammonium	274	78	1.378	1.242	1.213	1.172	1.200	0.962	1.078	0.975
Guanidinium	278	78	1.392	1.253	1.223	1.182	1.210	0.971	1.088	0.985
Tetramethylammoium	292	78	1.440	1.291	1.259	1.215	1.246	1.004	1.124	1.017
Thiazolium	320	78	1.536	1.368	1.332	1.281	1.316	1.069	1.196	1.082
Tropylium	333	78	1.580	1.403	1.365	1.312	1.349	1.100	1.229	1.112

Co

Ammonium	146	74.5	0.956	0.905	0.894	0.879	0.889	0.669	0.759	0.686
Hydroxylammonium	216	74.5	1.200	1.099	1.077	1.047	1.068	0.835	0.941	0.850
Methylammonium	217	74.5	1.203	1.101	1.080	1.049	1.070	0.838	0.944	0.853
Hydrazinium	217	74.5	1.203	1.101	1.080	1.049	1.070	0.838	0.944	0.853
Azetidinium	250	74.5	1.318	1.193	1.166	1.128	1.154	0.916	1.029	0.930
Formamidinium	253	74.5	1.329	1.201	1.174	1.136	1.162	0.923	1.037	0.937
Imidazolium	258	74.5	1.346	1.215	1.187	1.148	1.175	0.935	1.050	0.949
Dimethylammonium	272	74.5	1.395	1.254	1.223	1.181	1.210	0.968	1.087	0.982
Pyrrolinium	272	74.5	1.395	1.254	1.223	1.181	1.210	0.968	1.087	0.982
Ethylammonium	274	74.5	1.402	1.259	1.229	1.186	1.215	0.973	1.092	0.987
Guanidinium	278	74.5	1.416	1.270	1.239	1.196	1.226	0.982	1.102	0.996
Tetramethylammoium	292	74.5	1.465	1.309	1.276	1.229	1.261	1.016	1.139	1.029
Thiazolium	320	74.5	1.562	1.387	1.349	1.297	1.333	1.082	1.211	1.095
Tropylium	333	74.5	1.608	1.423	1.383	1.328	1.366	1.113	1.245	1.125

Ni

Ammonium	146	69	0.983	0.925	0.913	0.896	0.907	0.682	0.775	0.699
Hydroxylammonium	216	69	1.233	1.123	1.099	1.067	1.089	0.851	0.960	0.866
Methylammonium	217	69	1.237	1.126	1.102	1.069	1.092	0.853	0.963	0.869
Hydrazinium	217	69	1.237	1.126	1.102	1.069	1.092	0.853	0.963	0.869
Azetidinium	250	69	1.355	1.219	1.190	1.150	1.178	0.933	1.051	0.948
Formamidinium	253	69	1.366	1.228	1.198	1.157	1.185	0.940	1.059	0.955
Imidazolium	258	69	1.384	1.242	1.211	1.170	1.198	0.952	1.072	0.967
Dimethylammonium	272	69	1.434	1.281	1.249	1.204	1.235	0.986	1.109	1.000
Pyrrolinium	272	69	1.434	1.281	1.249	1.204	1.235	0.986	1.109	1.000
Ethylammonium	274	69	1.441	1.287	1.254	1.209	1.240	0.991	1.114	1.005
Guanidinium	278	69	1.455	1.298	1.265	1.218	1.250	1.001	1.125	1.015
Tetramethylammoium	292	69	1.506	1.338	1.302	1.253	1.287	1.035	1.162	1.048
Thiazolium	320	69	1.606	1.417	1.377	1.321	1.360	1.102	1.236	1.115
Tropylium	333	69	1.652	1.454	1.412	1.353	1.393	1.134	1.271	1.146

Pd

Ammonium	146	86	0.905	0.866	0.858	0.846	0.854	0.644	0.728	0.661
Hydroxylammonium	216	86	1.136	1.051	1.033	1.008	1.025	0.804	0.903	0.819
Methylammonium	217	86	1.139	1.054	1.036	1.010	1.028	0.806	0.905	0.821
Hydrazinium	217	86	1.139	1.054	1.036	1.010	1.028	0.806	0.905	0.821
Azetidinium	250	86	1.248	1.141	1.118	1.086	1.108	0.882	0.988	0.896
Formamidinium	253	86	1.258	1.149	1.126	1.093	1.116	0.889	0.995	0.903
Imidazolium	258	86	1.274	1.163	1.138	1.105	1.128	0.900	1.008	0.914
Dimethylammonium	272	86	1.320	1.200	1.173	1.137	1.162	0.932	1.043	0.946

Pyrrolinium	272	86	1.320	1.200	1.173	1.137	1.162	0.932	1.043	0.946
Ethylammonium	274	86	1.327	1.205	1.179	1.142	1.167	0.937	1.048	0.950
Guanidinium	278	86	1.340	1.216	1.189	1.151	1.177	0.946	1.058	0.959
Tetramethylammoium	292	86	1.386	1.253	1.224	1.183	1.211	0.978	1.092	0.991
Thiazolium	320	86	1.478	1.327	1.294	1.248	1.280	1.042	1.162	1.054
Tropylium	333	86	1.521	1.361	1.326	1.278	1.311	1.072	1.195	1.084

Pt

Ammonium	146	80	0.931	0.886	0.876	0.863	0.872	0.657	0.744	0.674
Hydroxylammonium	216	80	1.168	1.076	1.056	1.028	1.047	0.820	0.922	0.835
Methylammonium	217	80	1.172	1.078	1.058	1.030	1.049	0.822	0.925	0.837
Hydrazinium	217	80	1.172	1.078	1.058	1.030	1.049	0.822	0.925	0.837
Azetidinium	250	80	1.284	1.168	1.143	1.108	1.132	0.899	1.009	0.914
Formamidinium	253	80	1.294	1.176	1.150	1.115	1.139	0.906	1.017	0.921
Imidazolium	258	80	1.311	1.189	1.163	1.127	1.152	0.918	1.029	0.932
Dimethylammonium	272	80	1.358	1.227	1.199	1.160	1.187	0.951	1.065	0.964
Pyrrolinium	272	80	1.358	1.227	1.199	1.160	1.187	0.951	1.065	0.964
Ethylammonium	274	80	1.365	1.233	1.204	1.164	1.192	0.955	1.070	0.969
Guanidinium	278	80	1.379	1.244	1.214	1.174	1.202	0.965	1.080	0.978
Tetramethylammoium	292	80	1.426	1.281	1.250	1.207	1.237	0.997	1.116	1.010
Thiazolium	320	80	1.521	1.357	1.322	1.273	1.307	1.062	1.187	1.075
Tropylium	333	80	1.565	1.393	1.355	1.303	1.339	1.093	1.221	1.105

Cu

Ammonium	146	73	0.963	0.910	0.899	0.883	0.894	0.673	0.763	0.689
Hydroxylammonium	216	73	1.209	1.105	1.083	1.052	1.073	0.839	0.946	0.855
Methylammonium	217	73	1.212	1.108	1.086	1.055	1.076	0.842	0.949	0.857
Hydrazinium	217	73	1.212	1.108	1.086	1.055	1.076	0.842	0.949	0.857
Azetidinium	250	73	1.328	1.200	1.172	1.134	1.161	0.921	1.035	0.935
Formamidinium	253	73	1.339	1.208	1.180	1.142	1.168	0.928	1.043	0.942
Imidazolium	258	73	1.356	1.222	1.193	1.154	1.181	0.940	1.056	0.954
Dimethylammonium	272	73	1.405	1.261	1.230	1.187	1.217	0.973	1.093	0.987
Pyrrolinium	272	73	1.405	1.261	1.230	1.187	1.217	0.973	1.093	0.987
Ethylammonium	274	73	1.412	1.267	1.235	1.192	1.222	0.978	1.098	0.992
Guanidinium	278	73	1.426	1.278	1.246	1.202	1.232	0.987	1.108	1.001
Tetramethylammoium	292	73	1.476	1.317	1.283	1.236	1.268	1.021	1.145	1.034
Thiazolium	320	73	1.574	1.395	1.356	1.303	1.340	1.087	1.218	1.100
Tropylium	333	73	1.620	1.431	1.391	1.335	1.373	1.118	1.252	1.131

Zn

Ammonium	146	74	0.959	0.907	0.896	0.880	0.891	0.670	0.760	0.687
Hydroxylammonium	216	74	1.203	1.101	1.079	1.049	1.070	0.837	0.943	0.852
Methylammonium	217	74	1.206	1.104	1.082	1.051	1.072	0.839	0.945	0.854
Hydrazinium	217	74	1.206	1.104	1.082	1.051	1.072	0.839	0.945	0.854
Azetidinium	250	74	1.322	1.195	1.168	1.130	1.156	0.917	1.031	0.932
Formamidinium	253	74	1.332	1.203	1.176	1.138	1.164	0.925	1.039	0.939
Imidazolium	258	74	1.350	1.217	1.189	1.150	1.177	0.936	1.052	0.951
Dimethylammonium	272	74	1.399	1.256	1.226	1.183	1.213	0.970	1.089	0.984
Pyrrolinium	272	74	1.399	1.256	1.226	1.183	1.213	0.970	1.089	0.984
Ethylammonium	274	74	1.405	1.262	1.231	1.188	1.218	0.975	1.094	0.988
Guanidinium	278	74	1.419	1.273	1.241	1.198	1.228	0.984	1.104	0.998
Tetramethylammoium	292	74	1.468	1.312	1.278	1.231	1.264	1.017	1.141	1.031
Thiazolium	320	74	1.566	1.389	1.351	1.299	1.335	1.084	1.214	1.097
Tropylium	333	74	1.612	1.425	1.385	1.330	1.368	1.115	1.248	1.127

Cd

Ammonium	146	95	0.868	0.838	0.831	0.822	0.828	0.626	0.706	0.642
Hydroxylammonium	216	95	1.090	1.017	1.001	0.979	0.994	0.781	0.875	0.796
Methylammonium	217	95	1.093	1.020	1.004	0.981	0.997	0.784	0.878	0.798
Hydrazinium	217	95	1.093	1.020	1.004	0.981	0.997	0.784	0.878	0.798
Azetidinium	250	95	1.197	1.104	1.084	1.055	1.075	0.857	0.957	0.871
Formamidinium	253	95	1.207	1.112	1.091	1.062	1.082	0.864	0.965	0.878
Imidazolium	258	95	1.223	1.125	1.103	1.073	1.094	0.875	0.977	0.889
Dimethylammonium	272	95	1.267	1.161	1.137	1.104	1.127	0.906	1.010	0.919
Pyrrolinium	272	95	1.267	1.161	1.137	1.104	1.127	0.906	1.010	0.919
Ethylammonium	274	95	1.273	1.166	1.142	1.109	1.132	0.910	1.015	0.924
Guanidinium	278	95	1.286	1.176	1.152	1.118	1.141	0.919	1.025	0.933
Tetramethylammoium	292	95	1.330	1.212	1.186	1.149	1.175	0.950	1.059	0.963
Thiazolium	320	95	1.419	1.284	1.254	1.212	1.241	1.012	1.127	1.025
Tropylium	333	95	1.460	1.317	1.285	1.241	1.272	1.041	1.158	1.054

Hg

Ammonium	146	102	0.842	0.817	0.812	0.804	0.809	0.613	0.689	0.629
Hydroxylammonium	216	102	1.057	0.992	0.978	0.957	0.971	0.765	0.855	0.779
Methylammonium	217	102	1.060	0.994	0.980	0.960	0.974	0.767	0.857	0.781
Hydrazinium	217	102	1.060	0.994	0.980	0.960	0.974	0.767	0.857	0.781
Azetidinium	250	102	1.161	1.077	1.058	1.032	1.050	0.839	0.935	0.852
Formamidinium	253	102	1.170	1.084	1.065	1.039	1.057	0.845	0.942	0.859
Imidazolium	258	102	1.186	1.097	1.077	1.050	1.069	0.856	0.954	0.870
Dimethylammonium	272	102	1.229	1.132	1.110	1.080	1.101	0.886	0.987	0.900

Pyrrolinium	272	102	1.229	1.132	1.110	1.080	1.101	0.886	0.987	0.900
Ethylammonium	274	102	1.235	1.137	1.115	1.085	1.106	0.891	0.992	0.904
Guanidinium	278	102	1.247	1.147	1.125	1.094	1.115	0.899	1.001	0.913
Tetramethylammoium	292	102	1.290	1.182	1.158	1.124	1.148	0.930	1.034	0.943
Thiazolium	320	102	1.376	1.252	1.224	1.186	1.213	0.991	1.100	1.003
Tropylium	333	102	1.416	1.284	1.255	1.214	1.243	1.019	1.131	1.031

Ge

Ammonium	146	73	0.963	0.910	0.899	0.883	0.894	0.673	0.763	0.689
Hydroxylammonium	216	73	1.209	1.105	1.083	1.052	1.073	0.839	0.946	0.855
Methylammonium	217	73	1.212	1.108	1.086	1.055	1.076	0.842	0.949	0.857
Hydrazinium	217	73	1.212	1.108	1.086	1.055	1.076	0.842	0.949	0.857
Azetidinium	250	73	1.328	1.200	1.172	1.134	1.161	0.921	1.035	0.935
Formamidinium	253	73	1.339	1.208	1.180	1.142	1.168	0.928	1.043	0.942
Imidazolium	258	73	1.356	1.222	1.193	1.154	1.181	0.940	1.056	0.954
Dimethylammonium	272	73	1.405	1.261	1.230	1.187	1.217	0.973	1.093	0.987
Pyrrolinium	272	73	1.405	1.261	1.230	1.187	1.217	0.973	1.093	0.987
Ethylammonium	274	73	1.412	1.267	1.235	1.192	1.222	0.978	1.098	0.992
Guanidinium	278	73	1.426	1.278	1.246	1.202	1.232	0.987	1.108	1.001
Tetramethylammoium	292	73	1.476	1.317	1.283	1.236	1.268	1.021	1.145	1.034
Thiazolium	320	73	1.574	1.395	1.356	1.303	1.340	1.087	1.218	1.100
Tropylium	333	73	1.620	1.431	1.391	1.335	1.373	1.118	1.252	1.131

Sn

Ammonium	146	115	0.797	0.781	0.778	0.773	0.776	0.589	0.661	0.605
Hydroxylammonium	216	115	1.000	0.948	0.937	0.920	0.932	0.735	0.819	0.750
Methylammonium	217	115	1.003	0.951	0.939	0.922	0.934	0.737	0.821	0.752
Hydrazinium	217	115	1.003	0.951	0.939	0.922	0.934	0.737	0.821	0.752
Azetidinium	250	115	1.099	1.030	1.014	0.992	1.007	0.806	0.896	0.820
Formamidinium	253	115	1.108	1.037	1.021	0.998	1.014	0.813	0.903	0.826
Imidazolium	258	115	1.122	1.049	1.032	1.009	1.025	0.823	0.914	0.837
Dimethylammonium	272	115	1.163	1.082	1.064	1.038	1.056	0.852	0.946	0.866
Pyrrolinium	272	115	1.163	1.082	1.064	1.038	1.056	0.852	0.946	0.866
Ethylammonium	274	115	1.169	1.087	1.069	1.043	1.061	0.856	0.950	0.870
Guanidinium	278	115	1.180	1.096	1.078	1.051	1.070	0.865	0.959	0.878
Tetramethylammoium	292	115	1.221	1.130	1.110	1.081	1.101	0.894	0.991	0.907
Thiazolium	320	115	1.302	1.197	1.173	1.140	1.163	0.953	1.054	0.965
Tropylium	333	115	1.340	1.228	1.203	1.167	1.192	0.980	1.084	0.992

Pb

Ammonium	146	119	0.784	0.771	0.768	0.763	0.766	0.582	0.652	0.598
Hydroxylammonium	216	119	0.984	0.936	0.925	0.909	0.920	0.727	0.809	0.741
Methylammonium	217	119	0.987	0.938	0.927	0.912	0.922	0.729	0.811	0.743
Hydrazinium	217	119	0.987	0.938	0.927	0.912	0.922	0.729	0.811	0.743
Azetidinium	250	119	1.081	1.016	1.001	0.980	0.995	0.797	0.885	0.810
Formamidinium	253	119	1.090	1.023	1.008	0.987	1.001	0.803	0.891	0.817
Imidazolium	258	119	1.104	1.035	1.019	0.997	1.012	0.813	0.903	0.827
Dimethylammonium	272	119	1.144	1.068	1.051	1.026	1.043	0.842	0.934	0.855
Pyrrolinium	272	119	1.144	1.068	1.051	1.026	1.043	0.842	0.934	0.855
Ethylammonium	274	119	1.150	1.072	1.055	1.030	1.047	0.846	0.938	0.860
Guanidinium	278	119	1.161	1.082	1.064	1.039	1.056	0.855	0.947	0.868
Tetramethylammoium	292	119	1.201	1.115	1.095	1.068	1.087	0.884	0.979	0.896
Thiazolium	320	119	1.281	1.181	1.158	1.126	1.148	0.941	1.041	0.954
Tropylum	333	119	1.319	1.212	1.187	1.153	1.177	0.968	1.070	0.980

Eu

Ammonium	146	117	0.791	0.776	0.773	0.768	0.771	0.586	0.657	0.601
Hydroxylammonium	216	117	0.992	0.942	0.931	0.915	0.926	0.731	0.814	0.745
Methylammonium	217	117	0.995	0.944	0.933	0.917	0.928	0.733	0.816	0.747
Hydrazinium	217	117	0.995	0.944	0.933	0.917	0.928	0.733	0.816	0.747
Azetidinium	250	117	1.090	1.023	1.008	0.986	1.001	0.802	0.890	0.815
Formamidinium	253	117	1.099	1.030	1.014	0.992	1.008	0.808	0.897	0.821
Imidazolium	258	117	1.113	1.042	1.026	1.003	1.019	0.818	0.908	0.832
Dimethylammonium	272	117	1.154	1.075	1.057	1.032	1.050	0.847	0.940	0.860
Pyrrolinium	272	117	1.154	1.075	1.057	1.032	1.050	0.847	0.940	0.860
Ethylammonium	274	117	1.159	1.080	1.062	1.037	1.054	0.851	0.944	0.865
Guanidinium	278	117	1.171	1.089	1.071	1.045	1.063	0.860	0.953	0.873
Tetramethylammoium	292	117	1.211	1.122	1.102	1.074	1.094	0.889	0.985	0.902
Thiazolium	320	117	1.292	1.189	1.166	1.133	1.156	0.947	1.048	0.959
Tropylum	333	117	1.329	1.220	1.195	1.160	1.184	0.974	1.077	0.986

Tm

Ammonium	146	103	0.838	0.814	0.809	0.801	0.806	0.611	0.687	0.627
Hydroxylammonium	216	103	1.052	0.988	0.974	0.954	0.968	0.762	0.852	0.777
Methylammonium	217	103	1.055	0.991	0.977	0.957	0.971	0.764	0.854	0.779
Hydrazinium	217	103	1.055	0.991	0.977	0.957	0.971	0.764	0.854	0.779
Azetidinium	250	103	1.156	1.073	1.055	1.029	1.047	0.836	0.932	0.850
Formamidinium	253	103	1.165	1.081	1.062	1.035	1.054	0.842	0.939	0.856
Imidazolium	258	103	1.181	1.093	1.074	1.046	1.065	0.853	0.951	0.867
Dimethylammonium	272	103	1.223	1.128	1.107	1.077	1.098	0.884	0.984	0.897

Pyrrolinium	272	103	1.223	1.128	1.107	1.077	1.098	0.884	0.984	0.897
Ethylammonium	274	103	1.229	1.133	1.112	1.081	1.102	0.888	0.988	0.901
Guanidinium	278	103	1.242	1.143	1.121	1.090	1.111	0.897	0.998	0.910
Tetramethylammoium	292	103	1.284	1.178	1.154	1.121	1.144	0.927	1.031	0.940
Thiazolium	320	103	1.370	1.247	1.220	1.182	1.209	0.988	1.097	1.000
Tropylium	333	103	1.410	1.280	1.251	1.211	1.239	1.016	1.127	1.028

Yb

Ammonium	146	102	0.842	0.817	0.812	0.804	0.809	0.613	0.689	0.629
Hydroxylammonium	216	102	1.057	0.992	0.978	0.957	0.971	0.765	0.855	0.779
Methylammonium	217	102	1.060	0.994	0.980	0.960	0.974	0.767	0.857	0.781
Hydrazinium	217	102	1.060	0.994	0.980	0.960	0.974	0.767	0.857	0.781
Azetidinium	250	102	1.161	1.077	1.058	1.032	1.050	0.839	0.935	0.852
Formamidinium	253	102	1.170	1.084	1.065	1.039	1.057	0.845	0.942	0.859
Imidazolium	258	102	1.186	1.097	1.077	1.050	1.069	0.856	0.954	0.870
Dimethylammonium	272	102	1.229	1.132	1.110	1.080	1.101	0.886	0.987	0.900
Pyrrolinium	272	102	1.229	1.132	1.110	1.080	1.101	0.886	0.987	0.900
Ethylammonium	274	102	1.235	1.137	1.115	1.085	1.106	0.891	0.992	0.904
Guanidinium	278	102	1.247	1.147	1.125	1.094	1.115	0.899	1.001	0.913
Tetramethylammoium	292	102	1.290	1.182	1.158	1.124	1.148	0.930	1.034	0.943
Thiazolium	320	102	1.376	1.252	1.224	1.186	1.213	0.991	1.100	1.003
Tropylium	333	102	1.416	1.284	1.255	1.214	1.243	1.019	1.131	1.031