ANALYSES OF SOME MINERAL WATERS FROM TEXAS.

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In the Bulletin of the United States Geological Survey No. 32 (Mineral Springs of the United States), among the analyses of Texas waters, appear some partial analyses, with a reference to C. F. Chandler as analyst. The results there quoted were no doubt communicated by the proprietors of the springs, and represent the kind of examination requested by them. Those waters, however, and a few others examined about that time, were sufficiently interesting to induce us to make more extended examinations, which we think may be worthy of record.

The presence of weighable quantities of manganese in the most of these waters, as well as in some cases traces of zinc and copper, first attracted our attention as being not very common constituents of mineral waters. Indeed we have heard the opinion expressed that zinc and manganese were unheard of. But S. Dana Hayes reports the presence of 18.831 grains $Zn\,SO_4$ in a water from Mercer Co., W. Va. (Am. Chem., V., 277). Prof. Hardin's report on the Rockbridge Alum Springs of Virginia shows weighable quantities of Mn, Zn and Cu in those waters (Am. Chem., IV., 247), and Prof. Mallet finds Mn and Cu in the Capon Springs of W. Va. We have also found Mn in other mineral waters from Virginia, and a search through Dr. Peale's collection of statistics (Bulletin No. 32 above referred to) shows that the presence of manganese is recorded in waters from some 36 different localities, representing fifty or more springs. Many of these are waters from Pennsylvania, reported by Dr. Genth, but the element has been found by other analysts in waters from many other States. It is also reported as a constituent in several European waters, *e. g.*, the Vosges Mountains (C. Rend., Mar., 1880), the Pyrenees, Garegou (C. Rend., LXXXIV., 963), Birresborn (Berichte IX., 987), Bad Helmstedt (Jour. Pr. Chem., 1873, No. 5), etc.

Manganese no doubt has a therapeutical value, but on that point we do not feel competent to express a decided opinion.

The waters have been named according to the places from which they were sent. With the exception of the Houston water, which was alkaline, the waters were neutral, no free acid being discernable by tests with methyl orange or by any other means. In the Waco and Kosse waters, the acid present was insufficient to satisfy all of the bases present, leading to the inference that either basic salts were present, or, what we think is more probable, that the alumina or ferric oxide was combined with some organic acid or compound of unknown composition. A similar case is on record—Orchard Alum Springs of England, Dr. Thresh (*Chem. News*, XLVI., 226).

As to ferric compounds, in many cases the suspicion comes into the mind of the analyst, that oxidation may sometimes have occurred after drawing the water from the spring, but he can only report the conditions which he actually finds.

We give the details of actual quantities of bases found, as well as the probable combinations.

(Parts per 100,000.)

	Wootan No. 1.	Wootan.	Hearne.	Waco.	Bryan.	Kosse.	Houston
Na_2O	22.959	......	34.163	12.405	5.668	1.602	30.621
K_2O	3.589	......	1.918	1.322	1.257	......	4.380
Li_2O	......	......	......	......	......	......	trace.
MgO	22.480	30.000	45.607	18.569	16.036	5.616	26.339
CaO	43.230	46.470	71.943	44.125	32.477	9.209	55.794
BaO	......	......	......	......	......	......	trace.
ZnO	......	......	......	......	trace.	......	......
MnO	0.930	......	1.350	0.540	0.660	......	0.167
FeO	3.287	25.81	25.455	20.801	25.922	1.700	......
Fe_2O_3	1.696	......	6.640	6.209	5.347	......	0.175
Al_2O_3	2.092	......	6.784	0.650	7.330	6.539	0.185
CuO	......	......	......	......	......	......	......
Cl	41.739	60.800	27.886	12.977	6.849	1.834	102.200
SO_3	102.320	135.900	255.430	127.238	134.212	44.940	29.243
P_2O_5	......	......	0.140	......	......	......	0.020
SiO_2	5.63	5.550	4.420	5.485	11.055	5.20	2.290
Loss by ig'n	16.50	21.000	25.000	6.500	24.30	3.300	32.000
Res. Evap'n	256.70	340.200	530.000	270.500	317.00	88.680	275.000

(Parts per 100,000.)

	Wootan No. 1.	Hearne.	Waco.	Bryan.	Kosse.	Honston.
$NaCl$	43.319	45.934	21.387	10.694	3.023	57.686
$MgCl_2$	20.732	----------	----------	----------	----------	62.423
$CaCl_2$	----------	----------	----------	----------	----------	32.257
$MnCl_2$	----------	----------	----------	----------	----------	0.300
$CuCl_2$	----------	----------	----------	----------	----------	trace.
Na_2SO_4	----------	22.463	2.451	----------	9.700	--------
K_2SO_4	6.644	3.547	2.445	2.325	----------	8.108
$MgSO_4$	41.25	136.822	55.708	48.108	16.848	--------
$CaSO_4$	104.99	174.720	107.160	78.872	22.365	43.375
$ZnSO_4$	----------	----------	----------	trace.	----------	--------
$MnSO_4$	1.979	2.871	1.148	1.404	----------	--------
$FeSO_4$	6.939	53.739	43.912	54.735	3.526	--------
$Fe_2(SO_4)_3$	4.238	16.602	----------	13.367	----------	--------
$Al_2(SO_4)_3$	6.976	22.624	2.168	24.440	5.745	--------
Na_2HPO_4	----------	0.281	----------	----------	----------	0.041
$LiHCO_3$	----------	----------	----------	----------	----------	trace
$Ca(HCO_3)_2$	----------	----------	----------	----------	----------	62,575
$Ba(HCO_3)_2$	----------	----------	----------	----------	----------	trace.
$Fe(HCO_3)_2$	----------	----------	----------	----------	----------	0.389
SiO_2	5.630	4.420	5.485	11.055	5.400	2.290
Fe_2O_3	----------	----------	6.209	----------	----------	--------
Al_2O_3	----------	----------	----------	----------	4.816	0.185
Loss by ig'n	16.50	25.00	6.500	24.300	3.300	32.00
Res. Evap'n	256.70	530.30	270.500	317.00	88.680	275.00

(Grains per U. S. gallon of 231 cu. in.)

	Wootan No. 1.	Hearne.	Waco.	Bryan.	Kosse.	Honston.
$NaCl$	45.263	26.788	12.469	6.236	1.763	33.641
$MgCl_2$	12.090	----------	----------	----------	--------	36.404
$CaCl_2$	----------	----------	----------	----------	--------	18.812
$MnCl_2$	----------	----------	----------	----------	--------	0.175
$CuCl_2$	----------	----------	----------	----------	--------	trace.
Na_2SO_4	----------	13.100	1.429	----------	5.657	-------
K_2SO_4	3.875	2.068	1.426	1.486	--------	4.728
$MgSO_4$	24.056	79.792	32.488	28.056	9.825	-------
$CaSO_4$	61.228	101.893	62.494	45.997	13.043	25.296
$ZnSO_4$	----------	----------	----------	trace.	--------	-------
$MnSO_4$	1.154	1.674	0.670	0.819	--------	-------
$FeSO_4$	4.047	31.340	25.607	31.920	2.056	-------
$Fe_2(SO_4)_3$	2.472	9.861	----------	7.795	--------	-------
$Al_2(SO_4)_3$	4.068	13.192	1.264	14.230	3.350	-------
Na_2HPO_4	----------	0.164	----------	----------	--------	0.024
$LiHCO_3$	----------	----------	----------	----------	--------	trace.
$Ca(HCO_3)_2$	----------	----------	----------	----------	--------	36.492
$Ba(HCO_3)_2$	----------	----------	----------	----------	--------	trace.
$Fe(HCO_3)_2$	----------	----------	----------	----------	--------	0.227
SiO_2	3.283	2.578	3.199	6.447	3.149	1.335
Fe_2O_3	----------	----------	3.621	----------	--------	-------
Al_2O_3	----------	----------	----------	----------	2.809	0.108
Loss by ig'n	9.622	14.579	3.791	14.171	1.924	18.662
Res. Evap'n	149.702	309.260	157.488	175.945	52.369	157.750