National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material 1c

Argillaceous Limestone

(In Cooperation with the American Society for Testing and Materials)

(All analyses are based on samples dried 2 hours at 110 °C)

Constituent	SiO_2	Fe_2O_3	Al_2O_3	TiO_2	P_2O_5	MnO	CaO	SrO	MgO	Na_2O	K_2O	Loss on Ignition
Certified[1] Value, % by wt.	6.84	0.55	1.30	0.07	0.04	0.025	50.3	0.030	0.42	0.02	0.28	39.9
Estimated[2] Uncertainty	0.08	0.03	0.03	0.01	0.01	0.005	0.3	0.005	0.04	0.01	0.01	0.1
Method / Labs	Atomic Absorption	Atomic Absorption	Atomic Absorption	Atomic Absorption	Photometric	Atomic Absorption		Atomic Absorption	Atomic Absorption	Atomic Absorption	Atomic Absorption	
A	[a]6.82	[b]0.53	[b]1.33	[c]0.07	[d]0.04	[c]0.03	[f]50.40	- - -	[f]0.45	[g]0.03	[g]0.28	39.93
B	[b]6.77	[i]0.61	[j]1.31	[c]0.07	[d]0.03	[e]0.02	[k]50.19	- - -	[l]0.54	- - -	[g]0.29	39.80
C	6.82 [m]6.77 [b]6.80	0.55	1.27	[c]0.06	[d]0.05	[m]0.02 0.03	[n]50.18 [m]50.56 [f]50.20	0.03	[m]0.38 0.43	0.02	[m]0.28 0.29	39.82 39.85
D	[b]6.92	[i]0.55	[j]1.30	[o]0.066	[d]0.038	0.022	50.18	0.030	0.45	[g]0.02	[g]0.30	39.90
E	6.92	0.57	1.29	[m]0.066	[d]0.039	0.021	[k]50.57	0.031	0.41	0.028	0.27	39.87
F	6.76	0.57	- - -	0.08	0.04	0.027	50.52	0.03	0.42	0.02	- - -	39.97
G	[p]6.91	0.54	1.35,	0.07	[d]0.04	.0.027	[k]50.20	0.03	0.42	0.02	0.28	39.89
H	- - -	- - -	- - -	- - -	- - -	0.022	[g]50.58 [n]49.96	0.034	0.38	[g]0.025	[g]0.30	- - -

1. The certified value listed for a constituent is the present best estimate of the "true" value based on results of the cooperative analytical program for certification.
2. The estimated uncertainty of the "true" value is based on judgment and represents an evaluation of the combined effects of method imprecision, possible systematic errors among methods, and material variability for samples of 0.5 g or more. (No attempt was made to derive exact statistical measures of imprecision because several methods were involved in the determination.)
3. Detailed descriptions of many of the methods of analysis employed in the certification program for this SRM may be found in Part 13, Annual Book of ASTM Standards. They are also available as separate reprints, C25 and C114, from ASTM headquarters. ASTM Standard Technical Publication No. 395 also describes methods of analysis used in this certification work.

[a] Silicomolybdate photometric method.
[b] Ferron (8 hydroxy7-iodo-5-quinolinesulfonic acid) photometric method.
[c] Tiron (disodium-1,2 dihydroxybenzene-3,5-disulfonate) photometric method.
[d] Molybdenum blue photometric method.
[e] Peroxydisulfate photometric method.
[f] EDTA titration.
[g] Flame emission spectrometry
[h] Dehydration with HCl.
[i] $SnCl_2$ reduction-$K_2Cr_2O_7$ titration.
[j] By difference between total NH_4OH group and oxides of iron, phosphorus, and titanium.
[k] Calcium precipitated as oxalate and titrated with standard $KMnO_4$.
[l] Magnesium determined gravimetrically as $Mg_2P_2O_7$.
[m] X-ray fluorescence spectrometry.
[n] Atomic absorption spectrometry.
[o] H_2O_2 photometric.
[p] Dehydration with $HClO_4$.

(over)

PLANNING, PREPARATION, TESTING AND ANALYSIS:

The material for this SRM was provided by Lone Star Industries, Inc., Cement and Construction Materials Group, Houston, Texas, through the courtesy of C.W. Moore.

At NIST, the material was ground, sieved and thoroughly blended.

Chemical analyses for certification were performed in the following laboratories:

Atlantic Cement Co., Inc., Ravena, N.Y., F.J. Hogan and W. Twiss.
California Portland Cement Co., Colton, Calif., P. Hawkins and N. Norton.
Ideal Basic Industries, Cement Division, Ft. Collins, Colo., J.W. Yule.
Lone Star Industries, Inc., Cement and Construction Materials Group, Houston Texas, C.W. Moore, L.S. Scheline, and I.Z. Somcio.
Martin Marietta Laboratories, Baltimore, MD., E.H. Scott.
National Institute of Standards and Technology, Center for Analytical Chemistry, Gaithersburg, MD , T.C. Rains, M.B. Blackburn, T.J. Brady, J.D. Messman, and T.A. Rush, by R.K. Bell, Assistant Research Associate, ASTM-NIST Research Associate.
Portland Cement Association, Skokie, Ill., W.F. Mivelaz, R.F. Crow, E. LaBonde, A.G. Mateos, C.P. Palmiano, and H. Seiler.
Universal Atlas Cement, Division of United States Steel Corp., Ind., Z.T. Jugovic.

The overall direction and coordination of the technical measurements leading to certification were performed by J.I. Shultz, Research Associate, ASTM-NIST Research Associate Program.

The technical and support aspects involved in the preparation, certification, and issuance of this Standard Reference Material were coordinated through the Office of Standard Reference Materials by W.P. Reed.

Gaithersburg, MD 20899
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(Revision of certificate dated 12-14-78)

William P. Reed, Acting Chief
Office of Standard Reference Materials