National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material 88b

Dolomitic Limestone

This Standard Reference Material (SRM) is intended for use in the analysis of rocks, ores, minerals, and materials of similar matrix. SRM 88b is a powdered limestone that was passed through a sieve with a nominal opening of 250 μm (No. 60). Limestone is a major industrial raw material for the cement and refractory materials industries (including the steel industry). The control of constituents in limestone is essential to the quality control of the products and product additives.

The certified constituents for SRM 88b are given in Table 1. The certified values are based on measurements using two or more independent reliable methods or techniques. The listed uncertainty, except for CO_2 and P_2O_5 is $\pm$ two standard deviations of the certified value. The uncertainty primarily reflects differences between the various methods of analyses. The statistically derived uncertainty was extremely small for CO_2 and P_2O_5; therefore, the uncertainty for this constituent is based on judgment and exceeds $\pm$ two standard deviations. Noncertified values for constituent elements are given in Table 2 as additional information on the composition. The noncertified values should not be used for calibration or quality control. For user convenience, gravimetric factors for converting the oxides to elements are given in Table 3. All values are based on samples that were dried for 2 h at 110 °C and a minimum sample size of 250 mg.

Table 1 Certified Values for Constituents

Constituent	Content, Wt. %	Constituent	Content, Wt. %
Al_2O_3[e,g,h,k]	0.336 $\pm$ 0.013	MgO[c,g,h]	21.03 $\pm$ 0.07
CaO[c,g]	29.95 $\pm$ 0.05	Na_2O[a,e,f,k]	0.0290 $\pm$ 0.0007
CO_2[d,g,i]	46.37 $\pm$ 0.12	P_2O_5[b,h]	0.0044 $\pm$ 0.0003
Fe_2O_3[a,b,e,h,j] (Total Fe as Fe_2O_3)	0.277 $\pm$ 0.002	SiO_2[e,g,h]	1.13 $\pm$ 0.02
		SrO[a,e,f,j]	0.0076 $\pm$ 0.0003
K_2O[a,e,f,j]	0.1030 $\pm$ 0.0024		
MnO[a,b,h]	0.0160 $\pm$ 0.0012		

Statistical analysis was performed by R.C. Paule of the NIST Statistical Engineering Division.

This Certificate of Analysis has undergone editorial revision to reflect program and organizational changes at NIST and at the Department of Commerce. No attempt was made to reevaluate the certificate values or any technical data presented on this certificate.

The technical and support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by T.E. Gills. Revision of this certificate was coordinated by J.S. Kane.

Gaithersburg, MD 20899
May 20, 1994
(Revision of certificate dated 10-9-87)

Thomas E. Gills, Chief
Standard Reference Materials Program

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Table 2 Noncertified Values for Constituents

Constituent	Content, μg/g	Constituent	Content, Wt. %
CeO_2[k]	(4.7)	TiO_2[e,f]	(0.016)
CoO[k]	(1.3)		
Cr_2O[k]	(3.4)		
Cs_2O[k]	(0.17)	LOI[g](1000 °C for 18 h)	(46.98)
Eu_2O_3[k]	(0.15)		
HfO_2[k]	(0.16)	H_2O[g] (110 °C for 2 h)	(0.24)
Sc_2O_3[k]	(0.56)		
ThO_2[k]	(0.35)		

Methods/Techniques: (For use with Tables 1 and 2)

[a]Atomic Absorption Spectrometry
[b]Colorimetry
[c]Complexometric Titration
[d]Coulometry
[e]DC Plasma Emission Spectrometry
[f]Flame Emission Spectrometry
[g]Gravimetry
[h]Inductively Coupled Plasma Atomic Emission Spectrometry
[i]Inert Gas Fusion
[j]Isotope Dilution Mass Spectrometry
[k]Neutron Activation Analysis

Table 3 Gravimetric Factors Used for Conversion of Oxides to Elements (Compiled from International Atomic Weights of 1985)

Constituent	Gravimetric Factor	Constituent	Gravimetric Factor
Al_2O_3	0.52925	K_2O	0.83015
CaO	0.71469	MnO	0.77446
CeO_2	0.81408	MgO	0.60304
CO_2	0.27292	Na_2O	0.74186
CoO	0.78648	P_2O_5	0.43642
Cr_2O_3	0.68420	Sc_2O_3	0.65196
Cs_2O	0.94323	SiO_2	0.46743
Eu_2O_3	0.86361	SrO	0.84559
Fe_2O_3	0.69943	ThO_2	0.87881
HfO_2	0.84798	TiO_2	0.59941

PLANNING, PREPARATION, TESTING, AND ANALYSIS

The material for this SRM was provided by Material Service Corp., Chicago, IL. The source of the material was a mine near Skokie, IL. The material was received at NIST as a fine powder, 80 to 100 percent passing a 74 μm (#200) sieve. At NIST the material was sieved with a 250 μm (No. 60) sieve, blended, and placed in polyethylene lined aluminum cans for bulk storage.

Samples from the top and bottom of each can were analyzed using X-ray fluorescence, to establish homogeneity of the material. Seven elements, Mg, Fe, Ti, Cu, Si, K, and Al, were determined in 18 randomly selected samples of SRM 88b and no significant differences between samples were found for any of the measured elements.

Homogeneity testing was performed by G.A. Sleater of the NIST Inorganic Analytical Research Division.

Chemical analyses for certification were performed in the following laboratories:

NIST Inorganic Analytical Research Division, Gaithersburg, MD, D.A. Becker, T.A. Butler, Mo De-Ming, B.I. Diamondstone, R.C. Gauer, J.W. Gramlich, Yie Cuirong, J.D. Fassett, J.R. Moody, P.A. Pella, T.C. Rains, T.A. Rush, G.A. Sleater, R.L. Watters, Jr., and Y.S. Zhang.

Mineral Constitution Laboratory, Pennsylvania State University, University Park, PA, J.B. Bodkin, J.C. Devine, and H. Gong.