

National Institute for Environmental Studies

Certified Reference Material No.3

“Chlorella”

The national Institute for Environmental Studies (NIES) announces the availability of NIES Certified Reference Material No. 3, Chlorella

Chlorella is typical green algae that breed widely in lakes, rivers and ponds. In recent years, environmental pollution of the aquatic ecosystem by heavy metals and organic compounds is having adverse effects on animals, plants, fish and also on human health. Therefore an urgent requirement is to identify and monitor such substances in the hydrosphere. Besides its value for monitoring water pollution, Chlorella CRM will also be of use in basic studies since chlorella has already been used extensively as a research material.

The material was prepared from spray-dried chlorella (*Chlorella pyrenoidosa*) obtained from a commercial source. The chlorella powder was blended and bottled. The bottles contain about 36 grams of material.

Certified values are provided for K, Ca, Mg, Fe, Mn, Sr, Zn, Cu, Co, while reference values are reported for P, Pb, Cd and Sc.

Homogeneity Assessment

In order to estimate homogeneity of the material, the variation of elemental content in several bottles was examined by acid-dissolution followed by inductively coupled plasma emission spectrometry analysis. Eight bottles were randomly selected from the lot of 920 bottles and 3 aliquots were taken from each bottle. For the elements P, K, Ca, Mg, Fe, Mn, Sr, Zn and Cu, variations due to sample variability were estimated to be less than 1 % (as relative standard deviation), indicating that the prepared Chlorella satisfies the homogeneity criteria for a reference material.

Certified Values

The certified values are based on results of determinations by at least three independent analytical techniques. The uncertainties of the certified values were estimated based on consideration of 2 times the standard deviation of the mean of the acceptable values, and of the 95% confidence intervals for the mean of individual methods.

Instruction for Drying

The material should be dried in an air-oven at 85 °C for 4 hrs then cooled in a desiccator for 30 min before use. For the determination of volatile elements such as Hg and Se, should be done on samples separate to those for analysis.

Sample Size

A minimum sample weight of 300 mg of the dry material should be used.

Storage

The material should be kept tightly closed in its original bottle and stored in a desiccator at room temperature.

Certificate for NIES Certified Reference Material No. 3 "Chlorella"

Certified Values	
Element	Content*
Major and Minor Constituents (Wt. Percent)	
Iron ^{a,c,d,f,g,h}	0.185 ± 0.010
Calcium ^{a,b,c,d,f,g}	0.49 ± 0.03
Magnesium ^{a,c,f,g}	0.33 ± 0.02
Potassium ^{a,b,c,d,f}	1.24 ± 0.06
Trace Constituents (μ g/ g)	
Manganese ^{a,c,d,f,g}	69 ± 5
Strontium ^{a,b,c,d,f,g}	40 ± 3
Zinc ^{a,c,d,f,g}	20.5 ± 1.0
Copper ^{a,c,d,e}	3.5 ± 0.3
Cobalt ^{a,c,f}	0.87 ± 0.05

a:atomic absorption spectrometry,
c:inductively coupled plasma emission spectrometry
d:x-ray fluorescence spectrometry,
e: isotope dilution mass spectrometry
f: neutron activation analysis,
h:spectrophotometry,

b:flame emission spectrometry,
g: photo activation analysis

Reference Value	
	(Wt. Percent)
Phosphorus	1.7
	(μ g/g)
Lead	0.60
Cadmium	0.026
Scandium	0.013

* Based on dry weight: The material should be dried in an air-oven at 85°C for 4 hrs before use(mean moisture content, approximately 5%). A minimum sample size of 300 mg of the dry material should be used.