

METHOD SPECIFICATION
Faculty of Biosciences, NMBU

Method name: CHNS (DUMAS / total-nitrogen)

BIOVIT No.: Msp1039

1. Method of analysis/ Principle / Main instrument

The method determines the total amount of carbon, hydrogen, nitrogen, and sulfur in organic and most inorganic samples, both solid and liquid samples.

The method is optimized for small samples, and in the standard method 3-5 mg of the sample are needed.

It is possible to analyze semi-macro samples (up to 800 mg soil sample), but also up to 20 mg organic material, depending on the sample requirements. The method can be used to analyze everything from pharmaceutical samples to soil and plant material and is for example used for research on sediments or analysis of food.

- *The method provides the total amount of C, H, N and S in a sample. The levels of N will therefore in most cases be somewhat higher than the levels obtained from a Kjeldahl analysis of N.*
- *The instrument is also able to determine oxygen, but this requires a temporary modification of the instrument. This is not currently offered, but can be considered.*

Simultaneous CHNS analysis requires high temperature combustion in an oxygen-rich environment and is based on the classical Pregl-Dumas method. In the combustion tube ($t = 1150$ °C) carbon is converted to CO_2 ; hydrogen to H_2O ; nitrogen to N_2 and various nitrogen oxides N_xO_y , and sulfur to SO_2 . Various adsorbents are used to remove combustion products from other elements, such as halogens. The products are then passed through a reduction tube ($t = 850$ °C) of an inert carrier gas (helium). The tube is filled with copper which removes the excess oxygen while reducing N_xO_y to N_2 . The gas mixture is then transferred to three different columns, and the components are separated before they are detected by means of a thermal conductivity detector (TCD).

Main instrument: Vario El Cube elemental analyzer (Elementar Analysensysteme GmbH, Hanau, Germany) <http://www.elementar.de/en/products/vario-serie/vario-el-cube.html>

BIOVIT/NMBU						MSP
Prepared by Elin Follaug Johnsen	Approved by Hanne Kolsrud Hustoft	Valid from 21.08.16	Revision 03.2020	Replaced 08.2016	Document name Mps1039CHNS. docx	Page 1/2

2. Reference and any modifications:

ISO 16634 (2008); Cereals, legumes, grinded grain products, oilseeds, oilseed residues and animal feed. Determination of total nitrogen and crude protein content by combustion according to the Dumas principle.

3. Requirements for the degree of grinding and temperature of the sample for storage before analysis:

Solid samples must be homogenized- degree of grinding 0.5 mm. Store at room temperature. Wet or liquid samples are stored in a refrigerator or freezer.

4. Contact persons

Lab leader: Hanne Kolsrud Hustoft

Responsible for analysis: Hanne Kolsrud Hustoft and Elin Follaug Johnsen

5. Other literature

Application notes from Elementar (Hanau, Germany)

- AN-B-120809-E-01- CHNS analysis in coal with the vario EL cube
- AN-A-130209-E-01- CHNS analysis in food stuff with the vario EL cube
- AN-B-091208-E-01- CHNS analysis in liquid fuels with the vario EL cube

www.elementar.de/en/products/vario-serie/vario-el-cube.html

BIOVIT/NMBU						MSP
Prepared by Elin Follaug Johnsen	Approved by Hanne Kolsrud Hustoft	Valid from 21.08.16	Revision 03.2020	Replaced 08.2016	Document name Mps1039CHNS.docx	Page 2/2