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Fertilizers and soil conditioners — Determination of humic and hydrophobic fulvic acids concentrations in fertilizer materials

Engrais et amendements minéraux basique - Détermination des acides humique et fulvique

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 134, *Fertilizers and soil conditioners*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Humic substances are present in all ecosystems: oceans, rivers, lakes, and top soils. Quantifying the amount of humic material present in these systems is essential for academic research and commercial applications, specifically agricultural soil and plant management.

The increased use of humic substances in agriculture has generated intense interest among producers, consumers, and regulators for a reliable method for quantification of the active ingredients in raw humic ores and commercial fertilizer products; specifically humic and fulvic acids. As both commercial trade and regulation of humic products are based on percentage (%) of the humic and fulvic acids in commercial humic products, use of % units instead of SI units is warranted, therefore incorporated into this standard.

This document establishes a method for the determination of humic acids (HA) and acidic hydrophobic fulvic acids (HFA). The method is based on an existing preparative procedure use by the International Humic Substances Society (IHSS) for extracting high purity HA and HFA from soil samples[1], which is a modified form of the "classical" technique described in detail by Stevenson[2]. The "classical" methods and the IHSS method were developed as preparative methods for the fractionation of soil organic matter; they were not intended to be used as quantitative analytical methods. The classical method of extracting humic acids and *fulvic acids* from soil humus utilize a "strong base" to extract the alkaline soluble materials, and then the alkaline extract solution is acidified to flocculate the humic acids, which appear to precipitate out of solution. The remaining substances in solution after alkaline and acid treatment were called *fulvic acids*.

This method modifies the "classical" technique in a number of ways:

— it determines the quantity of humic substances on an "ash free" basis (mineral salts excluded);

— the alkali extraction is done under anoxic conditions to reduce oxidation of the analytical sample during extraction;

— it defines the materials that are soluble in both alkali and acid as the Fulvic Fraction;

— it can differentiate products containing certain non-humic materials that some manufactures claim to contain humic substances;

— it further defines HFA as materials of low sulfur content[3] that bind to a hydrophobic resin at pH 1[4][5][6], instead the classical, and perhaps more common definition, for *fulvic acids* as materials that are defined as soluble in both acid and alkali solution. This stricter definition is necessary to distinguish HFA from mineral salts, polysaccharides, amino sugars, amino acids, proteins, acids, and carbohydrates that are extracted along with humic substances when using the "classical" method[1][4].

See Annex B for information on ISO/CD 19822 interlaboratory study.

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Fertilizers and soil conditioners — Determination of humic and hydrophobic fulvic acids concentrations in fertilizer materials

1 Scope

This document specifies the procedure for the analysis of humic acids and hydrophobic fulvic acids which is applicable to dry and liquid materials used as ingredients in commercial fertilizers, soil amendments, and geological deposits.

2 Normative References

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
hydrophobic fulvic acids
HFA
materials composed of less than 0,75 % elemental sulfur (S) that are soluble in aqueous alkaline and acid solution and are adsorbed at pH 1 onto a polymeric adsorbent resin of moderate polarity. The resin is of a type designed for adsorption of amphiphilic compounds having molecular weights typical of fulvic acids

3.2
fulvic fraction
alkali extracted portions of humic substances that are soluble in both alkali and acid aqueous solutions

3.3
humic acids
HA
alkali extracted humic substances that are insoluble in strongly acidic solution and will precipitate from the alkali extract in acid solutions of pH 1

3.4
humic substance
major organic constituent of natural organic matter consisting of complex heterogeneous mixtures of carbon-based substances formed by biochemical reactions during the decay and transformation of plant and microbial remains

3.5
lignosulfonates
amorphous light to dark brown powder or liquid derived from the sulfite pulping of softwoods. The lignin framework is a sulfonated random polymer of three aromatic alcohols: coniferyl alcohol, p-coumaryl alcohol, and sinapyl alcohol, of which coniferyl alcohol is the principle unit

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