Determination of organic carbon in solutions of humic substances

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The ratio of the content of humic acids (HA) to the content of fulvic acids (FA) can be used as an index of the degree of humification of humic substances (HS). It is possible to determine the HA/FA on the basis of determining the amount of organic carbon contained in the composition of humic acids or fulvic acids - CHA/CFA. The classical method is the Tyurin method, which consists in the oxidation of all organic substances of the studied fraction of humic substances with an excess of a solution of potassium dichromate in dilute sulfuric acid with further determination of the amount of dichromate remaining in the solution. Now there are more advanced methods, for example, the method of determining TOC (Total Organic Carbon). The method of determining TOC allows analyzing large batches of samples faster.

Potassium humates CHP-K Powhumus (Humintech, Germany), CHS-K "Sakhalin Humate" (Biomir2000, Russia) and PHA-K "Kostroma humate" were used as the studied samples. For the analysis, the samples were dissolved on distilled water, the ash part is separated by centrifugation. After centrifugation, a supernatant (HS) was decanted into a conical flask. To separate humic acids from fulvic acids, an aliquot of a 20.00 ml supernatant was taken into a 50.0 ml beaker. pH of solution was adjusted to 1 by 5 M hydrochloric acid solution, after that the solution was transferred to a 25.0 ml measuring flask and the solution was brought to the mark with a 0.1 M hydrochloric acid solution. The solution was poured into a falcon and left for 3 hours, during which time there is a complete precipitation of humic acids. After three hours, the falcon was centrifuged and centrifugate (FA) was poured into pure falcon. The carbon content of HS and FA was determined by the TOC determination method using the TOC-L carbon analyzer (Shimadzu, Japan). The determination of CHA/CFA was carried out according to GOST [26213-91], by the Tyurin method with two endings. The first is the titration of the remaining dichromate by the solution with a Mohr salt in the presence of phenylanthranilic acid, the second is the spectrophotometric analysis of solutions. CHA defined as the difference between CHS and CFA. Values of CHA/CFA determined by different methods are presented in the table below

Table 1. Values of CHA/CFA determined by different methods

Sample	CHA/C _{FA} , titration.	CHA/C _{FA} , UV-vis	CHA/C _{FA} , TOC
CHP-K	7,7 ± 2,1	8,0 ± 1,9	8,1 ± 1,6
CHS-K	10,5 ± 2,0	10,1 ± 1,3	9,9 ± 1,1
PHA-K	1,4 ± 0,1	1,4 ± 0,1	1,4 ± 0,1

It has been shown that the use of the TOC method has a number of advantages over the method for determining organic matter according to GOST due to its greater reproducibility and rapidity.

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