Development of a reference standard based on natural humic acids for the determination of organic carbon

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Determining the content of total organic carbon (OC) in natural objects (soil, peat, vegetation) is an important and topical issue. It is one of the most widely used analyses in the world. Currently, an oxythermography device has been created, which is equipped with two sensors for registering an oxidizer, i.e. air exiting a high-temperature reactor. Programmed oxidation of the analyzed natural sample is conducted in the reactor. The device can simultaneously determine the oxidizability of the analyzed sample and the OC content in it. The analysis requires a small weighed amount of a dry sample of humic acids (soil, peat, HAs) ~0.03 g. The device can be used both in laboratory conditions and in the field. For metrologically correct measurements and reliable interpretation of the results obtained, reference standards are required [1, 2]. The authors propose using the commercial Rostok humic agent as such a standard. It is produced by the LLC SPC Evrika SIE (a small innovative enterprise) of the SAU of the Northern Trans- Urals [3]. The agent's composition, its homogeneity, stability of its properties and composition over time (>10 years) were determined, and the optimum conditions for thermal oxidation were selected. The authors assume that the stability of the dry natural HA agent is due to the absence of microbiological processes. The preparation contains OC (%): 44.7 ± 0.3 ($n = 25$, $P = 0.95$), $s_r = 0.5\%$.

Figure 1. Calibration graph of the HAs preparation obtained by oxythermography at 570-670 K.

HAs fully correspond to the composition of peat and its flammable properties. The method is reliably reproducible; inorganic carbon does not interfere with the analysis.

References

1. Boldyrev I.V. ISO/IEC 17025:2017. Practical recommendations for use. SPb.: TSOP «Profession», 2020. 128 s. (In Russ.)
2. Akland M.I., Ponosov V.I. Reference materials and their use. *Industrial laboratory. Diagnostics of materials*. 2018;84(1(II)):6-13. (In Russ.) [https://doi.org/10.26896/1028-6861-2018-84-1\(II\)-06-13](https://doi.org/10.26896/1028-6861-2018-84-1(II)-06-13)
3. Grekhova I.V. Features of production and use of humic preparations. Collection of articles of the All-Russian Scientific and Practical Conference: Modern Scientific and Practical Solutions in the Agro-Industrial Complex. Part 1. Tyumen: GAU SZ. 2017. S. 600-604. (In Russ.)