

MEASUREMENT OF THE HEATS OF COMBUSTION OF NATURAL COMBUSTIBLE GASES IN THE COMBUSTION BOMB CALORIMETER

A. V. Inozemtsev, J. O. Inozemtsev, Yu. N. Matyushin, and A. B. Vorob'ev

N. N. Semenov Federal Research Center for Chemical Physics of the Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation

Abstract: A bomb calorimeter design for measuring the calorific values of combustible gases is proposed and tested. The energy equivalent of calorimeter does not depend on the standard substance burned — gas (high-purity methane) or benzoic acid. The sources of the error of calorimetric measurements are determined and design solutions are proposed that allow obtaining accurate results. Data on the measurements are provided, a comparison of the obtained values confirms the correctness of the technical solutions.

Keywords: bomb calorimeter; volumetric heat of combustion; calorific value; energy equivalent; measurement error

DOI: 10.30826/CE19120406

Acknowledgments

This work was supported by the subsidy given to the N. N. Semenov Federal Research Center for Chemical Physics of the Russian Academy of Sciences to implement the state assignment on the topic 0082-2016-0011 “Fundamental studies of conversion processes of energetic materials and development of scientific grounds of controlling these processes” (State Registration No. AAAA-A17-117040610346-5).

References

1. Inozemtsev, A. V., Ya. O. Inozemtsev, Yu. N. Matyushin, A. I. Vorob'ev. 23.04.2019. Bombovyy kalorimetr peremennoy temperatury dlya opredeleniya udel'noy ob'emnoy teploty sgoraniya goryuchego gaza [Bomb calorimeter of variable temperature for determining the specific volumetric heat of combustion of a combustible gas]. Application to the Patent of Russian Federation No. 2019112243.
2. Oleynik, B. N. 1973. *Tochnaya kalorimetriya* [Precise calorimetry]. Moscow: Izd-vo standartov. 207 p.
3. Vasil'ev, Ya. V., and N. I. Matskevich. 1984. Teplovoy ekvivalent lineynykh kalorimetricheskikh sistem [Thermal equivalent of linear calorimetric systems]. *Collection of scientific papers*. Novosibirsk: IK SO AN SSSR. 90–123.
4. Vorob'ev, A. B., Yu. N. Matyushin, T. S. Kon'kova, B. P. Larionov, and Yu. A. Lebedev. 1979. *Pribory i metody tochnoy kalorimetrii* [Equipment and methods of precise calorimetry]. *8th All-Union Conference on Calorimetry and Chemical Thermodynamics Abstracts*. Ivanovo. 2:462.
5. Inozemtsev, A. V., Ya. O. Inozemtsev, Yu. N. Matyushin, and A. B. Vorob'ev. 2018. Sposob opredeleniya udel'noy ob'emnoy teploty sgoraniya prirodnogo goryuchego gaza v kalorimetre i ustroystvo dlya zapolneniya kalorimetricheskoy bomby goryuchim gazom [A method for determining the specific volumetric heat of combustion of natural combustible gas in a calorimeter and a device for filling a calorimetric bomb with combustible gas]. Patent RU 2646445 C1.
6. Inozemtsev, A. V., Ya. O. Inozemtsev, and A. B. Vorob'ev. 2018. Izmerenie teplot sgoraniya prirodnikh goryuchikh gazov v kalorimetre szhiganiya s bomboy [Measurement of the heats of combustion of natural combustible gases in the combustion bomb calorimeter]. *Goren. Vzryv (Mosk.) — Combustion and Explosion* 11(2):24–30.

Received October 28, 2019

Contributors

Inozemtsev Alexey V. (b. 1976) — research scientist, N. N. Semenov Federal Research Center for Chemical Physics of the Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; vectrl@yandex.ru

Inozemtsev Jaroslav O. (b. 1966) — senior research scientist, N. N. Semenov Federal Research Center for Chemical Physics of the Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; vectrl@yandex.ru

Matyushin Yuri N. (b. 1940) — Doctor of Science in technology, head of laboratory, N. N. Semenov Federal Research Center for Chemical Physics of the Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; professor, National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), 31 Kashirskoe Sh., Moscow 115409, Russian Federation; ynm07@mail.ru

Vorob'ev Alexey B. (b. 1946) — Candidate of Science in technology, senior research scientist, N. N. Semenov Federal Research Center for Chemical Physics of the Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation; vectrl@yandex.ru