MODERN APPROACHES TO THE INTRODUCTION OF SCIENCE INTO PRACTICE

Abstracts of X International Scientific and Practical Conference

San Francisco, USA
30-31 March 2020

-

Library of Congress Cataloging-in-Publication Data

UDC 01.1
The X th International scientific and practical conference « MODERN APPROACHES TO THE INTRODUCTION OF SCIENCE INTO PRACTICE » (March 30-31, 2020). San Francisco, USA 2020. 535 p.

ISBN 978-1-64871-895-3

Published by bookwire.com

Collection of scientific articles published is the scientific and practical publication, which contains scientific articles of students, graduate students, Candidates and Doctors of Sciences, research workers and practitioners from Europe, Ukraine, Russia and from neighbouring coutries and beyond. The articles contain the study, reflecting the processes and changes in the structure of modern science. The collection of scientific articles is for students, postgraduate students, doctoral candidates, teachers, researchers, practitioners and people interested in the trends of modern science development.

The recommended citation for this publication is:
Barantsova I., Kotlyarova V., Tkach M., The intercultural dialogue as the basis of personality development // Modern approaches to the introduction of science into practice. Abstracts of X International Scientific and Practical Conference. San Francisco, USA 2020. Pp.43-46.
URL: http://isg-konf.com .

CHEMISTRY

APPLICATION OF MnO_X – BASED ELECTRODES INTO THE INDUSTRIEL PRODUCTION OF ELECTRIC BOILERS

Poltavets Veronika Vladimirovna, Ph.D.
Oles Honchar Dnipro National University

Vargalyuk Viktor Fedorovich
Ph.D., Professor
Oles Honchar Dnipro National University

Shevchenko Ludmila Vasilivna
Ph.D., Associate Professor
Oles Honchar Dnipro National University

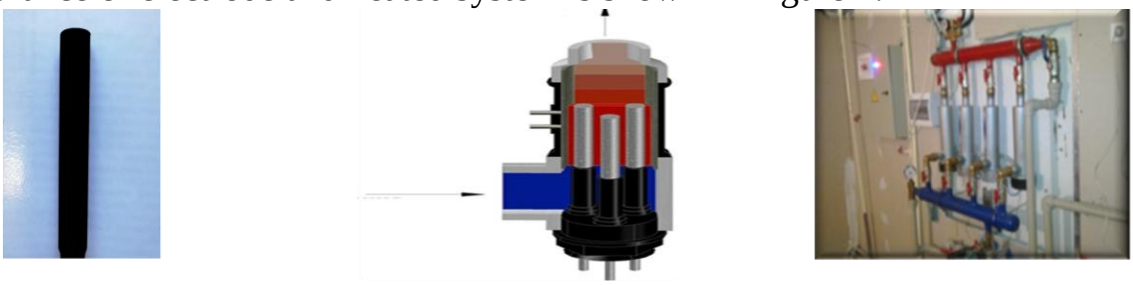
Alternative energy devices have recently become particularly popular [1 - 3] . Thus, electrode boilers for direct conversion of electric energy into heat can be installed in any type of premises, they allow to use previously installed pipes and radiators and achieve significant energy savings.

To ensure durability and reliability in operation, the working electrodes of such installations must have high thermal and corrosion resistance under the influence of strong electric fields. In addition, the decomposition of heat carriers, especially water, should not occur on the electrode surface during the operation of the heater, since the result of water splitting is an explosive mixture (H_2+O_2).

The use of titanium, lead, nickel, and various steel marks as electrode materials in electrolyzers with the industrial voltage of 220 V is accompanied by their destruction and gas release. Considering the capability of Mn^{3+} / Mn^{4+} redox system [4] to provide high-speed cycling of electric charge at potentials significantly lower than the water splitting potential, we have developed composite MnO_x coated electrodes on metal oxidized substrate. Simple carbon steel was used as the substrate. The MnO_x film was deposited electrochemically from an electrolyte containing monobasic carboxylic acids. Mixed electroneutral complexes $[Mn(L)_2(H_2O)_4]$ formation ensured the deposition of MnO_x-based composite at low potentials. The corrosion resistance of the obtained composite films was very high. The industrial tests of the developed Fe, FeO_y/MnO_x electrodes showed their ability to work for at least 10000 hours.

The potential of $Mn^{3+} \leftrightarrow Mn^{4+}$ reaction that ensures electric charge cycling is quite high. If 1 mg MnO_x is placed on an electrode with the geometric surface of 1 cm^2, such a system will be able to pass an alternating current of 50 Hz with the Faraday component of the reaction $Mn^{3+} \leftrightarrow Mn^{4+}$ $\overline{i_f}$ = 77,8 А/см^2.

The developed electrodes were introduced into the industrial production of electric boilers "Energy" with direct heat carrier heating of various capacities, which are used in residential premises and other facilities. Their long-term operation confirmed their high performance characteristics. The developed devices were installed in hotels, kindergartens, entertainment centers and other buildings. Eternal appearance of electrode and heated system is shown in Figure 1.



1 2 3

Fig. 1. 1 - eternal appearance of electrode, 2 - electric boiler, 3 - heated system

Some objects, where electric boilers have been installed, are shown in Figures 2, 3.

Fig. 2. Dnipro city, the Palace of Children and Youth

Fig. 3. Premises Station, Station Diyivka

References

1. Deng B., Zhang M., Lyu J., Li S., Yang H. Safety analysis on the water wall in the 350 MW supercritical CFB boiler under sudden electricity failure // Energy. – 2019. - № 189. –13 P. DOI: 10.1016/j.energy.2019.116364

2. Singh J., Vasudev H., Singh S. Performance of different coating materials against high temperature oxidation in boiler tubes – A review // Materials Today: Proceedings. – 2020. – 7 P. DOI: 10.1016/j.matpr.2020.01.156

3. Park H., Han K., Yu G., Jang J., Park S., Kim H., Min K., Kim J. Properties of bioliquids and their impacts on combustion and boiler operation // Energy. – 2020. - № 193. – 11 P. DOI: 10.1016/j.energy.2019.116782

4. Wei W., Cui X., Chen W. Manganese oxide-based materials as electrochrmical supercapacitor electrodes // Chem. Soc. Rev. – 2011. – Vol.40, №3. – pp. 1697 – 1721. DOI: 10.1039/C0CS00127A