INTERNATIONAL JOURNAL ON ORANGE TECHNOLOGY

https://journals.researchparks.org/index.php/IJOT e-ISSN: 2615-8140 | p-ISSN: 2615-7071

Volume: 4 Issue: 10 | October 2022

Thermal Study of New Refractory Heat-Shielding Materials Based on Mineral Raw

A.H.Kuldashev

Ph.D. in Technology, docent

(Ministry of Emergency Situations of the Republic of Uzbekistan),

I.U.Madjidov

Doctor of Technology, professor

(National university of Uzbekistan named after M. Ulugbek),

S.M.Djuraev

Ph.D. in Technology, docent

(Scientific research institute for fire safety and emergency situations, Ministry of Emergency Situations of the Republic of Uzbekistan)

---***---

Annotation: *the authors of the article provide information on the thermal studies carried out to obtain new fire and heat-shielding compositions based on local raw materials, including the study of their properties.*

Key words: *aluminum oxide, wollastonite, sodium water glass, silica, thermal action, thermogravimetry, local raw materials, endothermic and exothermic effects*

A significant acceleration in the development of new types of materials is achieved by using methods that show the contribution of each additive to various indicators of the models being developed. The use of thermal analysis methods has a traditional character, because this analysis provides information about the beginning of thermal and thermal-oxidative transformations, including the kinetic and thermophysical features of the course of these processes. Thermal analyzes make it possible to determine a number of physicochemical and thermochemical parameters, as well as to obtain information about the mechanism of action of ingredients on the processes of pyrolysis and thermal-oxidative degradation of materials. Thermal analysis data allow you to more accurately control the processes of decomposition of substances and materials. Based on this, thermal studies of the obtained samples of materials were carried out. [1-6].

This paper presents the results of thermal studies of the obtained new samples of refractory heat-shielding materials based on local mineral such as aluminum oxide, wollastonite, sodium liquid glass, silica.

On the heating curve of the composition of a sample of aluminum oxide, silica, sodium carboxymethyl cellulose, sodium water glass, three endothermic effects were found at temperatures of 110, 360, 4320C and seven exothermic effects at temperatures of 240, 304, 322, 400, 420, 475, and 6520C. The first endothermic effect proceeded with the removal of moisture. Weight loss in the temperature range of 90-150 0C according to the TG curve was 3.60%. A further increase in

INTERNATIONAL JOURNAL ON ORANGE TECHNOLOGY

https://journals.researchparks.org/index.php/IJOT e-ISSN: 2615-8140 | p-ISSN: 2615-7071

Volume: 4 Issue: 10 | October 2022

temperature led to a slow decrease in temperature. The total decreasing mass in the temperature range 90-9000C according to the TG curve was 7.21%.

The heating curve of a sample of the composition of sodium carboxymethylcellulose, sodium liquid glass was characterized by a single endothermic effect at a temperature of 1380C and two exothermic effects at temperatures of 360 and 4520C. The nature of the first endothermic effect was due to the removal of water. Weight loss in the temperature range 90-1500C according to the TG curve was 2.46%. The nature of subsequent thermal effects caused a slow decrease in mass. The total weight loss according to the TG curve in the temperature range of 90-9000C was 7.65%.

The DTA curve for the composition of a sample of kaolin, finely dispersed wollastonite, and water glass revealed two endothermic effects at temperatures of 115, 1300C and seven exothermic effects at temperatures of 200, 230, 295, 370, 400, 477, and 6700C. All detected thermal effects proceeded with a decrease in mass. The total weight loss in the temperature range 60-9000C according to the thermogravimetry curve was 19.82%.

The heating curve of the sample composition from aluminum oxide, finely dispersed wollastonite, sodium water glass was characterized by two endothermic effects at temperatures of 140, 2100C and three exothermic effects at temperatures of 340, 440 and 5450C. The found thermal effects were accompanied by a decrease in mass. The total weight loss in the temperature range 60-9000C along the thermogravimetry curve was 14.08%.

On the heating curve of the composition of a sample of sodium liquid glass, calcium oxide, four endothermic effects were observed at temperatures of 110, 170, 206, 2750C and six exothermic effects at temperatures of 305, 348, 432, 472, 535, and 6880C. The detected thermal effects proceeded with a decrease in mass. The total weight loss in the temperature range 60-9000C along the thermogravimetry curve was 18.40%.

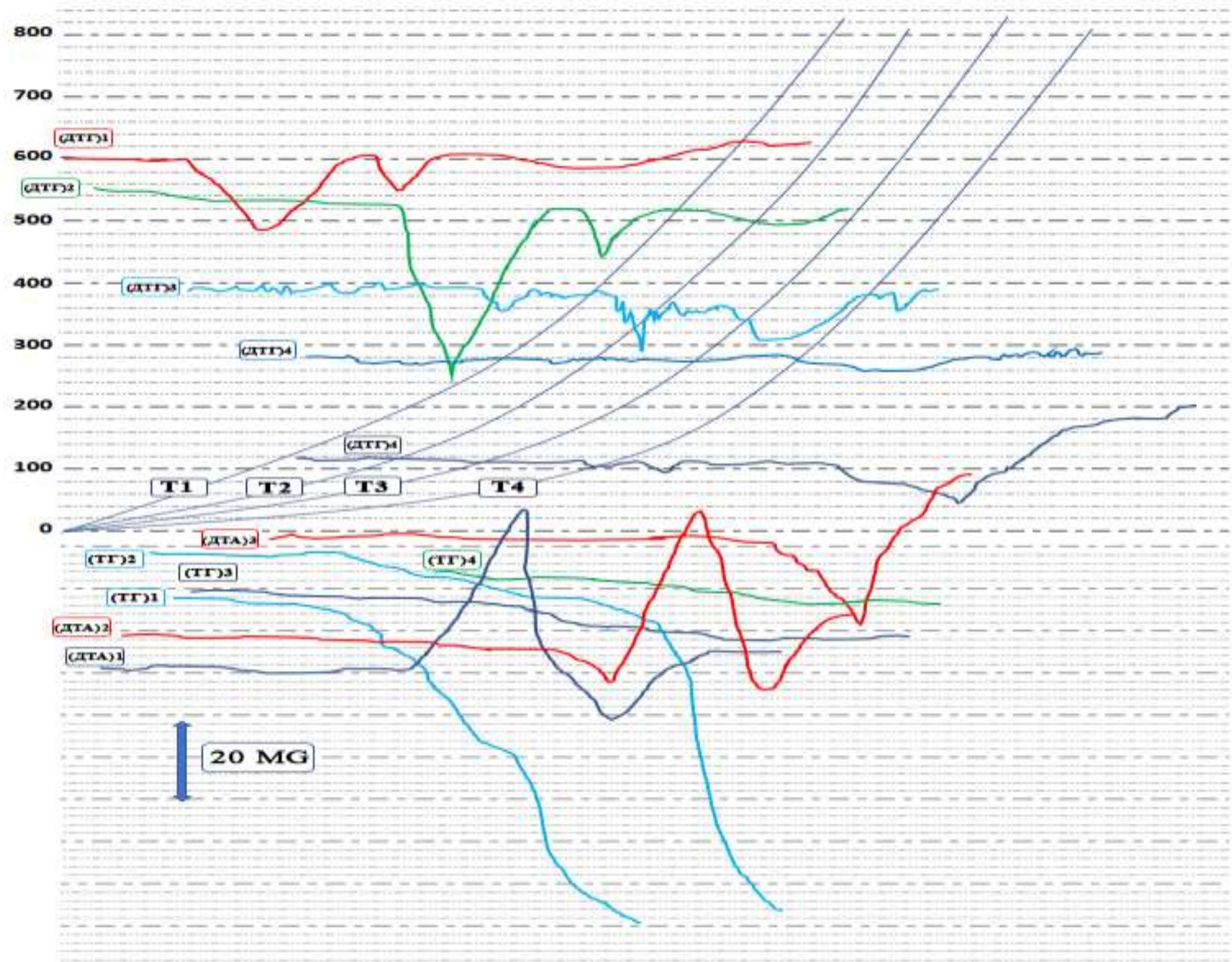
The heating curve of the sample composition of silicon dioxide nanoparticles, sodium liquid glass, was characterized by seven endothermic effects at temperatures of 132, 150, 170, 185, 230, 320, 3680C and three exothermic effects at temperatures of 460, 520, 6600C. The manifested thermal effects were accompanied by a decrease in mass. The total weight loss in the temperature range 60-9000C according to the thermogravimetry curve was 30.77%.

The heating curve of the sample composition from the finely dispersed mineral wollastonite, sodium liquid glass was characterized by a single endothermic effect at a temperature of 1380C and two exothermic effects at 360 and 4520C. The nature of the first endothermic effect is due to the removal of water. Weight loss in the temperature range 90-1500C according to the TG curve was 2.46%. The nature of subsequent thermal effects caused a slow decrease in mass. The total weight loss according to the TG curve in the temperature range of 90-9000C was 7.65%.

The heating curve of a sample of the composition of sodium water glass, silica, wollastonite mineral, was characterized by a single endothermic effect at a temperature of 1380C and two exothermic effects at temperatures of 360 and 4520C. The nature of the first endothermic effect was due to the removal of water. Weight loss in the temperature range 90-1500C according to the TG curve was 2.46%. The nature of subsequent thermal effects caused a slow decrease in mass. The total weight loss according to the TG curve in the temperature range of 90-9000C was 7.65%.

INTERNATIONAL JOURNAL ON ORANGE TECHNOLOGY
https://journals.researchparks.org/index.php/IJOT e-ISSN: 2615-8140 | p-ISSN: 2615-7071
Volume: 4 Issue: 10 | October 2022

The heating curve of the composition of the sample from the mineral wollastonite, calcium carbonate, sodium liquid glass was characterized by a single endothermic effect at a temperature of 1380C and two exothermic effects at temperatures of 360 and 4520C. The nature of the first endothermic effect was due to the removal of water. Weight loss in the temperature range 90-1500C according to the TG curve was 2.46%. The nature of subsequent thermal effects caused a slow decrease in mass. The total weight loss according to the TG curve in the temperature range of 90-9000C was 7.65%.



Picture-1. Thermograms of the newly obtained compositions

Further, in order to predict the effectiveness of the developed fire and heat protective compositions, a thermal analysis of the obtained compositions was carried out on the basis of data obtained through differential thermal analysis (DTA). Further work on obtaining high decorative qualities, effective fire-resistant protective compositions was carried out using local mineral raw materials (aluminum oxide, dolomite, wollastonite and silica) with grain sizes less than 160 microns.

The experiments and calculations carried out made it possible to draw the following important conclusion: in the presence of aluminum oxide and silica in the fire and heat protection mixture, the

https://journals.researchparks.org/index.php/IJOT e-ISSN: 2615-8140 | p-ISSN: 2615-7071
Volume: 4 Issue: 10 | October 2022

mixture effectively exhibits flame retardant properties throughout the entire ignition time, actively opposing itself to the fire front due to air layers from water vapor. Such sequentially formed air layers appear in the temperature range of 100-200, 300-500 and 600-900 ° C, significantly lowering the temperature of the fire front, delaying the spread of an open flame for a certain time and stretching (in some cases preventing) the phase of active combustion. Thus, the resulting compositions based on the above mineral raw materials (aluminum oxide, dolomite, wollastonite and silica) can effectively act as a protective barrier, actively counteracting the temperature rise on the surface of the material, blocking the path to the process of propagation of the fire front and heat.

Bibliography:

1. Yeremina T.YU. Snijeniye pojarnoy opasnosti stroitelnih konstruksiy za schet primeneniya effektivnih ognezaщitnhi sredstv. Dis. … d-ra tex. Nauk. – Moskva. 2004. – 328 s.
2. Smirnov N.V. Prognozirovaniye pojarnoy opasnosti stroitelnih materialov. Disc. … d-ra tex. Nauk. – Moskva. 2002. – 273 s.
3. Zabolotskaya A.V. Texnologiya i fiziko-himicheskiye svoystva poristih kompozitsionnih materialov na osnovi jidkogo stekla i prirodnih silikatov. Disc. … kand. teh. nauk. – Tomsk. 2003. – 150 s.
4. Drevko I.B. Teploizolyasionnie materiali na osnove modifitsirovannogo jidkogo stekla s povishennoy vodostoykostyu. Disc. … kand. teh. nauk. – Saratov. 2003. – 137 s.
5. Kurbanbayev SH.E., Nurmuxammadov J.SH., Dusmatov X.M.,
6. Mirzayev S.Z. Polucheniye i issledovaniye novogo negoryuchego poristogo materiala na osnove mestnogo mineralnogo sirya. Yong‘in-portlash xavfsizligi ilmiy-amaliy elektron jurnal. 2020 yil. №1. – S. 23-28.
7. Arifov P.A., Tillayev A.T., Erkabayev F.I., Kurbanova N.S., Kurbanbayev SH.E. Razrabotka sostavov dlya izgotovleniya ognezashitnih past i shtukaturok / Materiali nauchno-prakticheskoy konferensii «Aktualnie problemi sovershenstvovaniya kachestva podgotovki kadrov v sfere obespecheniya pojarnoy bezopasnosti v respublike Uzbekistan”. – Tashkent. 2013. – S. 191-192.