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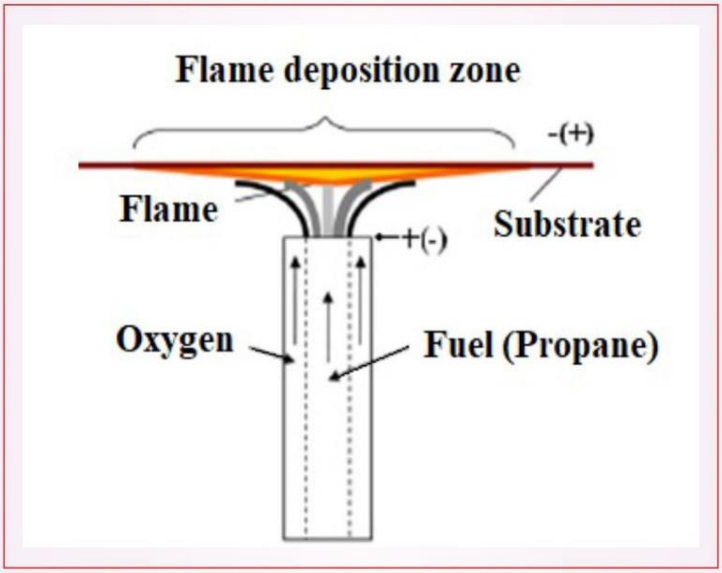

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«COMBUSTION AND PLASMOCHEMISTRY»

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SELECTIVE HYDROGENATION OF ACETYLENE TO ETHYLENE ON COBALT CATALYSTS

[1]Aitugan A.N., [1,2]Tanirbergenova S.K., [1,2]Tileuberdi Ye., [1,2]Mansurov Z.A.

[1]Al-Farabi Kazakh National University, Almaty, Kazakhstan
[2]Institute of combustion problems, Almaty, Kazakhstan

The main industrial process of large-scale production of light unsaturated compounds, such as ethylene, propylene, butenes, and various aromatic compounds (benzene, toluene, xylenes, etc.) is pyrolysis of gasoline fractions of oil, naphtha and liquefied hydrocarbon gases, in whose thermal conversions acetylene and diene hydrocarbons are formed along with olefins in small amounts. Their allocation is often not economically feasible. The presence of them as impurities makes it impossible to further use olefins for polymerization processes. Thus, acetylene hydrocarbons poison ethylene polymerization catalysts, so their content in the ethylene fraction fed to the polymerization should be below 1 ppm. Therefore, one of the most important tasks in preparing the feed for the preparation of various polymers is the hydrogenation of diene and acetylene hydrocarbons without the complete hydrogenation of olefins containing only one double bond to alkanes.

Currently, acetylene and diene hydrocarbons from fractions fed to further polymerization are removed by selective hydrogenation using special catalysts. In this connection, the urgent task is to develop highly effective selective hydrogenation catalysts characterized by stability, high olefin selectivity and high catalytic activity.

Various supported catalysts are used as selective hydrogenation catalysts in the industry, which allow to increase the surface of the active component, prevent sintering and save expensive metal. Platinum group metals are used as active components of supported hydrogenation catalysts for multiple carbon-carbon bonds in industry: Pt, Rh, Ru, Pd, deposited on different supports, copper, cobalt, nickel supported on different supports are also used.

Despite the high selectivity of hydrogenation, using of catalysts containing noble metals increases the cost of the process. The most suitable is a cobalt-based hydrogenation catalyst, which has high activity and relatively low cost compared to noble metal catalysts.

Several types of clays of various deposits were taken as a carrier: white, green, red, and Tonkeria clay. To study the activation process of mineral raw materials, carburization was carried out and the chemical composition of clays of the neighboring regions of Kazakhstan was determined

Important feature of the clay structure is the presence of a three-dimensional anionic framework constructed of SiO_4 and AlO_4 tetrahedra, interconnected by strong bridges Si-O-Si and Si-O-Al. Due to this, a system of intracrystalline pores and cavities is formed, having dimensions of several angstroms, in which occlusion and release of molecules of the corresponding size easily occurs. The presence of these pores and cavities in the clay framework is associated with the well-

known molecular sieve properties of clays - the ability to selectively adsorb and desorb molecules of certain sizes.

Studying the chemical composition of clays and studying the carbonization process, we can say that all clays can be used as carriers of cobalt carbon catalysts. The main components of clays of various deposits are SiO_2, CaO and Al_2O_3.

Clay-based cobalt catalysts were prepared by impregnation followed by calcination. The impregnation was carried out by immersion of the carrier in a concentrated solution of cobalt salt. The impregnated clay undergoes a process of carbonization during 3-5 hours. The resulting catalyst containing 2-7% cobalt was used to hydrogenate acetylene.

Their catalytic activity in the acetylene hydrogenation reaction was tested. A study of the activity of the synthesized catalysts was carried out in a high-pressure laboratory apparatus in the temperature range of 50-300 °C, pressures of 0.1-3.0 MPa, and a space velocity of 1.0-4.0 h-1. The hydrogen feed rate was 30-60 ml / min. It was experimentally determined that the study of the activity of 2-7% cobalt supported catalyst results in the formation of ethylene, ethane and by-products such as methane.

The influence of the composition of cobalt catalysts on supports on the efficiency in the reactions of hydrogenation of acetylene to ethylene is determined where 5% cobalt catalysts supported on clay are optimal. On this catalyst, the ethylene yield selectivity is 80%.

As a result, it is possible to synthesize catalysts for the selective hydrogenation of acetylene in order to obtain ethylene in the gas phase and can be used in the purification of gas mixtures of acetylene impurities.

REFERENCES

1. Technical Regulations of the Customs Union TR CU 013/2011 "On requirements to automobile and aviation gasoline, diesel and marine fuel, jet fuel and heating oil." Approved the decision of the Customs Union Commission № 826 from 18.10.2011
2. Rh-Promoted carbon catalysts to obtain clean components of motor fuels. S. K. Tanyrbergenova, A. Temirkhan, Z. A. Mansurov, N. K. Zhylybayeva, and G. M. Naurzbayeva.International Journal of Chemical Engineering and Applications. Vol. 7, No.1, February 2016..
3. Haijie Sun, Yajie Pan, Shuaihui Li, Yuanxin Zhang, Yingying Dong, Shouchang Liu, Zhongyi Liu. Selective hydrogenation of benzene to cyclohexene over Ce-promoted Ru catalysts // Journal of Energy Chemistry. 2013. Vol. 22. No. 5. P. 710-716.
4. Selective hydrogenation of benzene over Rh-promoted zeolite catalysts. S.K. Tanirbergenova, N.K. Zhylybayeva, A. Temirkhan, A.B. Issayeva, Z.A. Mansurov. Global Journal of Advanced Engineering Technologies and Sciences. August, 2015. Impact Factor 2.365. P. 1-7..
5. Hydrogenation of acetylene in excess ethylene on an alumina-supported palladium catalyst at atmospheric pressure in spinning basket/ W.T. McGown, C. Kemball, D.A. Whan, M.S. Scurell// J. Chem. Soc. Faraday Trans. 1977. - v. 73, № 4.-p. 632.
6. Hydrogenation catalysts formation in the system AlEt3-Co(acac)2,3 / F.K. Shmidt, L.O. Nindakova, B.A. Shainyan, V. V Saraev, N.N. Chipanina, V.A. Umanetz // J. Mol. Catal. A Chem. — 2005. — V. 235, № 1–2. — P. 161–172.