CATALYTIC CRACKING OF RESIDUAL FEEDSTOCKS TO COMPONENTS OF MOTOR FUEL

S.V. Lysenko, S.V. Baranova, E.A. Karakhanov

Moscow State University, Department of Chemistry, Moscow, Russia

baranovasv@mail.ru

In the context of green chemistry the rational utilization of crude is very important task. Therefore there is a general trend of the increasing input of residual feedstocks into refining. The Fluid Catalytic Cracking (FCC) plays significant role in efficient processing of crude. One of the main problems in the processing of residual feedstocks is the poisoning of cracking catalysts by metals, such as nickel and vanadium. The deposition of heavy metals on the catalyst surface decreases the yield of the target products (motor fuel fractions) and drastically increases the undesired coke deposition on catalyst.

Heavy metals passivation is frequently used in high-capacity units abroad. For instance, treatment of poisoned catalysts with antimony compounds decreases the poisoning activity of heavy metals.

We have synthesized water-soluble passivators of nickel on the basis of mixed antimonyl-ammonium tartrate and ammonium phosphate. It's noteworthy that depending on the ratio of ingredients in the passivator it is possible to regulate the ratio of different cracking products. The efficiency of the antimony-based passivator depends on the properties of the poisoned catalyst and the composition of cracked feedstock.

Some exemplary results obtained on the pilot plant using a water-soluble passivator on the basis of mixed antimonyl-ammonium tartrate are listed below. Prior to testing commercial microspherical catalyst was poisoned by heavy metals in the course of catalytic cracking of the mixture of 80 wt% vacuum gas oil and 20 wt % atmospheric residue. At the beginning of the introduction of the passivator the catalyst contained about 0.50 wt % of heavy metals, including 0.24 wt % of nickel. The cracking feedstock was vacuum gas oil from a blend of West Siberian and Tatarian crude oils with boiling ranges of 300-500^{o}C.

As a result, the main parameters of cracking significantly improved. For instance, the yield of gasoline increased by 7.5 %, and the gasoline selectivity increased by 8.0 %. The formation of undesirable products has considerably decreased: coke by 22 %, and hydrogen by 40 %. The ratio of antimony to nickel was approximately 0.4.

The emission of the metal-containing catalyst dust into atmosphere from high-capacity cracking units depends of the equipment's quality. The optimization of the process of passivation makes it practically environmentally safe.