Features of the process of propane dehydrogenation on $LnVO_3$ systems synthesized by solid-phase synthesis

E.B. Markova, T.F. Sheshko, A.G. Cherednichenko.
Peoples' Friendship University of Russia (RUDN University), Moscow, st. Mikluho-Maklay, 6, 117198 RF, e-mail: *ebmarkova@gmail.com*

A number of studies [1] have shown that compounds containing vanadium can catalyze the dehydrogenation of light hydrocarbons and extend their service life. Therefore, the creation of catalytic systems containing both vanadium and rare earth elements is very promising.

The object of our study is the vanadites of rare earth elements of the composition $LnVO_3$ (Ln = La Ce Pr Nd Pm Sm Eu Gd Tb Dy Ho Er Tm Yb Lu). Orthovanadates are formed by solid-phase high-temperature interaction of stoichiometric amounts of V_2O_5 and REE (III) oxide according to the reaction:

$$V_2O_5 + Ln_2O_3 = 2\ LnVO_4$$

$$LnVO_4 + H_2 = LnVO_3 + H_2O$$

In the thermal cracking of propane, the formation of products began above 773K, and at 873K the conversion was only 2%. In addition to shifting the degree of half conversion to lower temperatures, the selectivity for olefins in comparison with thermal cracking also changes (Figure1). In the case of catalytic cracking in the temperature range 623–1123 K, the yield of olefins increased.

The yield of target products of ethylene and propylene increases from lanthanum to gadolinium, and then declines.

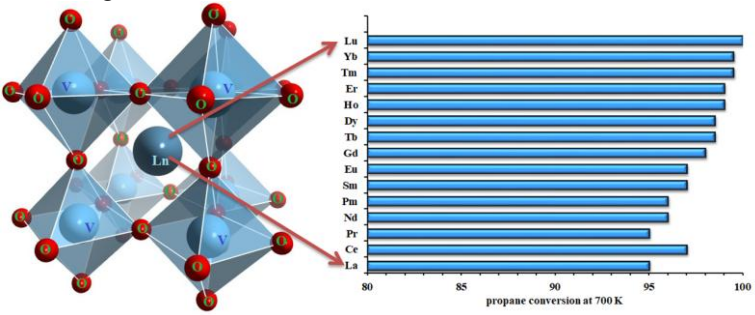

Fig. propane dehydrogenation on $LnVO_3$ systems

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References

[1] E.B. Markova, A.S. Lyadov, V.V. Kurilkin, J. Physical Chemistry A. 90 (2016): 1754