Platinum-based zeolite containing catalysts [17, 23–25], which allow to rise light fraction yields are mainly used in heavy oil hydro treatment.

The aim of the present work is to develop zeolite containing modified polyfunctional catalysts for heavy paraffins hydro processing and to study their properties and performance in tetradecane treatment process.

Experimental

Modified with additives of molybdenum, phosphorus and cerium zeolite-containing polyfunctional catalysts Fe(5 %)-Pt(0,4 %)/Al_2O_3 (KT-17, KT-18) were synthesized. KT-17 contains Mo, P and Ce as modifying additives. KT-18 is modified with cerium and phosphorus.

Properties of catalysts were studied by methods of Electron Microscopy, X-ray phase analysis, BET, IRS, Mossbauer spectroscopy. Genesis of catalyst was studied by Mossbauer spectroscopy method under varying conditions (t, air, H_2). Isomeric shifts (IS) were performed according to α-Fe.

Structure and dimensionality of metal particles, which are the active phase of catalysts, were tested in catalytic transformation of C_{14} alkanes obtaining gasoline fraction. Study was carried out in a stainless steel tubular reactor uniformly coated with electric heater. The reactor was filled first with 3 ml of quartz, then with catalyst (10 ml, d = 2–2.5 mm), pre-treated by hydrogen at 400 °C for 2 hours, and with 3 ml of quartz (particle size is 2–3 mm).

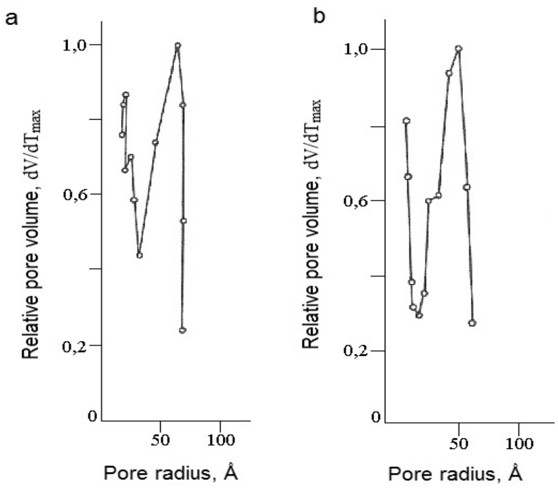
Catalysts were studied in C_{14} treatment process at 280–400 °C temperature range, hydrogen pressure of 2 MPa, H_2:raw material ratio 200:1, and the volume rate of 5 h^{-1}.

0.83 ml / min of raw material was pumped to the reactor by drain pump. The reaction products were cooled and separated, liquid products were collected in the tank, and gas products were directed to gas meter.

The hydrocarbon content of reaction products was analyzed in γ-aluminum oxide stainless steel column of Chrom-4 chromatograph (Supelco) with argon as carrier gas.

Results and Discussion

Specific surface area of synthesized catalysts, measured by the BET method, is 192.5 m^2/g for KT-17 and 222.7 m^2/g for KT-18; porosity is 0.49 cm^3/g and 0.48 cm^3/g respectively (Fig. 1).



a — KT-17; *b* — KT-18

Figure 1. Porosity of catalytic systems

The KT-17 sample contains two types of narrow and one type of wide pores (Fig. 1, *a*). Narrow pores are available for formation of light hydrocarbons. Wide pores improve the adsorption capacity of catalyst in relation to hydrocarbons processing.

KT-18 catalyst has one type of narrow and wide pores available for adsorption and desorption of hydrocarbons (Fig. 1, *b*). Adsorption and activation of hydrogen and formation of lower alkanes molecules as result of deep hydrocracking of feedstock can occur in narrow pores.

Results of X-ray phase analysis show that catalyst KT-17 has structural elements of HZSM (reflexes 11.4; 6.7; 3.9 Å), Mo (reflex 2.30Å) (ASTM 4–809) and γ-Al_2O_3 (reflex 1.98 Å). Structural elements of HZSM (reflexes 3.84; 3.73 Å) and Al_2O_3 (reflexes 2.26; 1.97; 1.40 Å) were found in catalyst KT-18.