



# KINETIC CHARACTERISTICS OF CATALYSTS BASED ON MESOPOROUS SILICAGELS DOPED WITH DISPROSIUM, LANTHANUM AND MODIFIED WITH NI, IN THE HYDROGENATION REACTIONS OF AROMATIC HYDROCARBONS

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## THE RESEARCH AIM

Synthesis of mesoporous silicagel doped with dysprosium, lanthanum, modified with nickel (Dy-Ni/MC, La-Ni/MC) and study of their catalytic properties in the reaction of hydrogenation of aromatic hydrocarbons.

## STUDY OF TEXTURE AND MORPHOLOGY

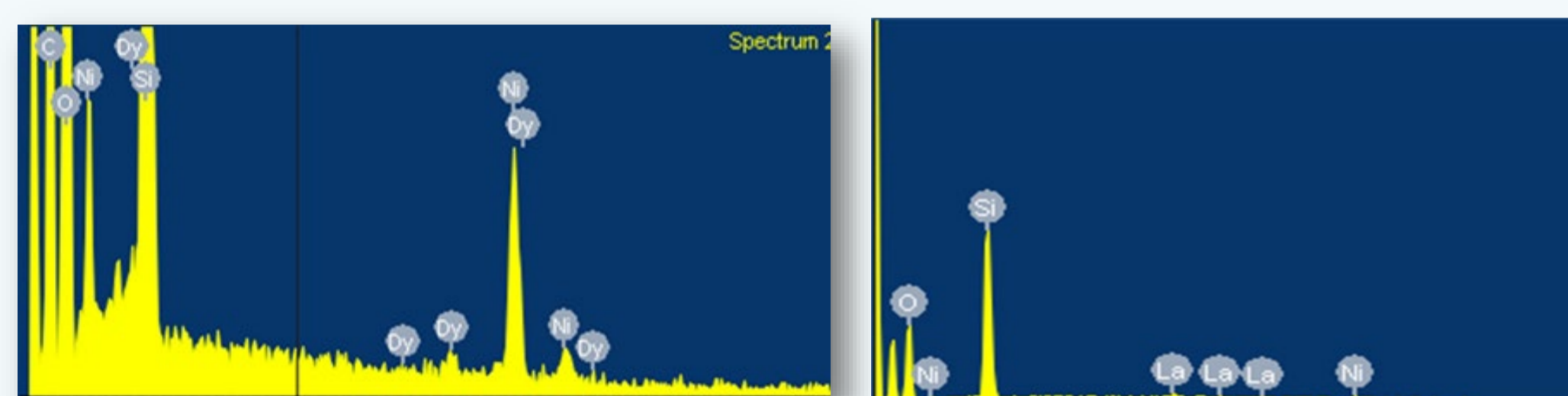
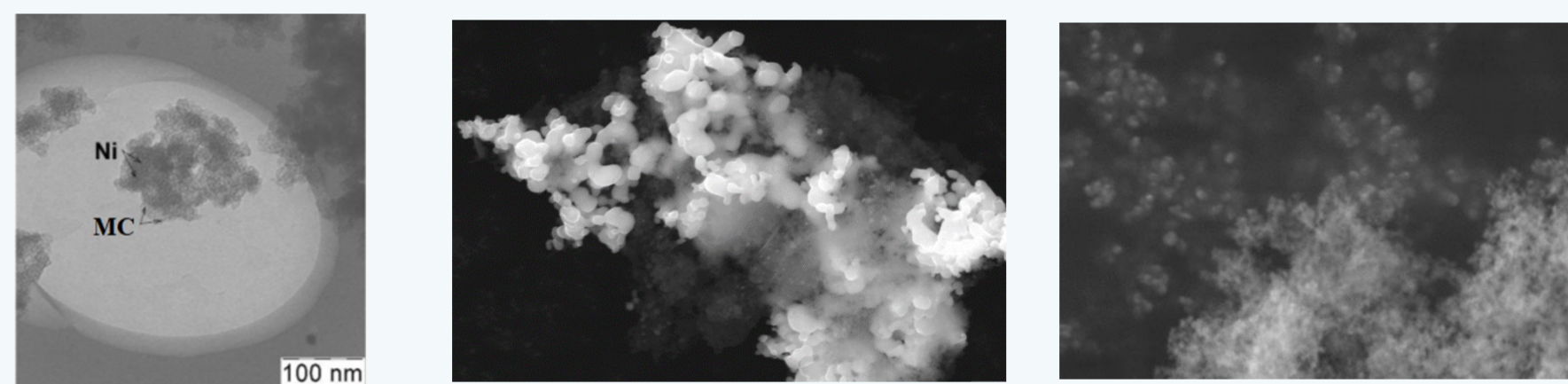


Fig. XRF spectra: a) Dy-Ni/MC, b) La-Ni/MC



a) TEM image for Dy-Ni/MC, b) SEM image for Dy-Ni/MC, c) SEM image for La-Ni/MC

Fig. 2. a) TEM image for Dy-Ni/MC, b) SEM image for Dy-Ni/MC, c) SEM image for La-Ni/MC

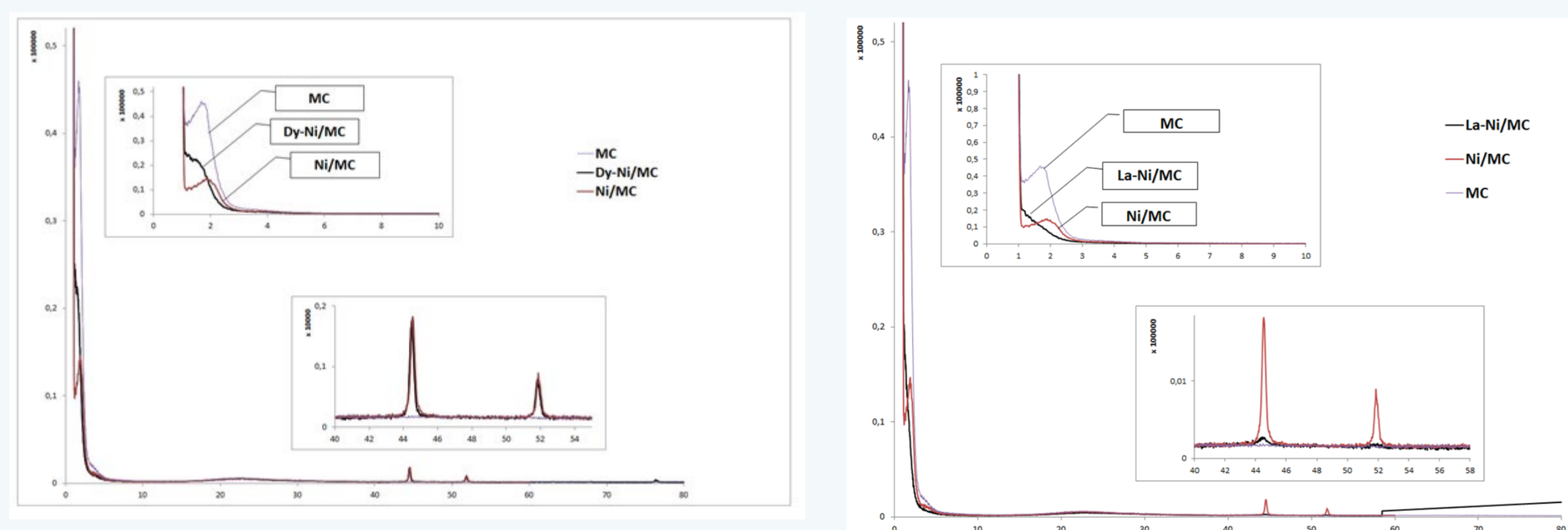


Fig. 3. Diffractogram for unmodified MC, Ni/MC, Dy-Ni/MC, La-Ni/MC

## EXPERIMENT

The study of the kinetics of hydrogenation of benzene, ethylbenzene, o-, m- and p-xylenes was carried out on an original installation, which allows *on-line* analysis and hydrogenation of the reaction mixture. The carrier gas is helium. The mass of the catalysts was equal to 0.3 g. The volume of injected samples into the reactor was 1  $\mu$ L. The volume of the reactor is 1 ml. The calculation of the rate constants of the hydrogenation reactions was carried out by a graphical method using the kinetic equation of the first order reaction (since hydrogen was taken in a large excess). The study was carried out in the temperature range 80-170  $^{\circ}$ C and a hydrogen pressure of 3 atm.

## RESULTS

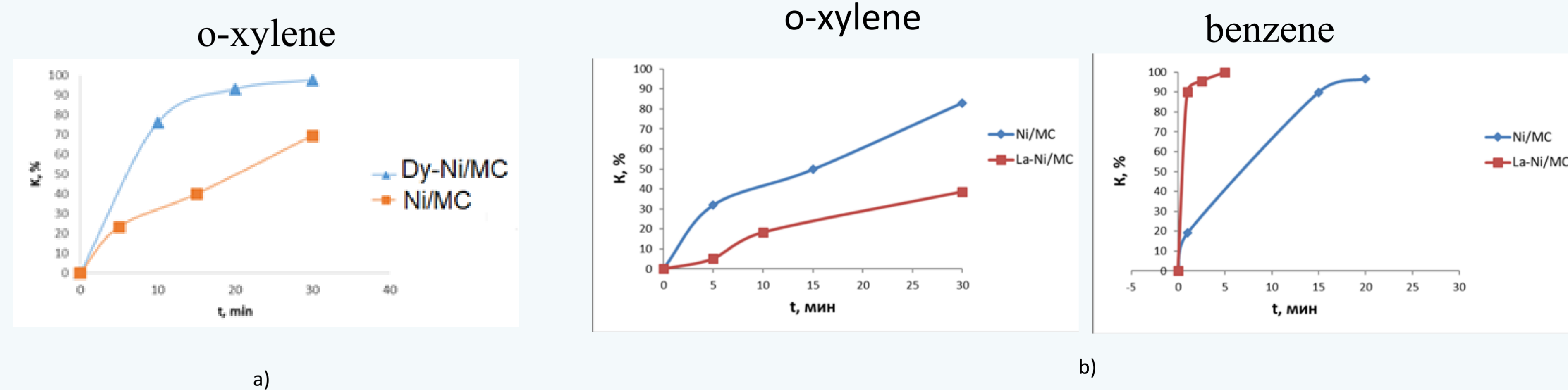


Fig.4. Influence of a rare earth element on the conversion of o- xylene and benzene (150  $^{\circ}$ C, 3 atm) on catalysts: a) Ni/MC and Dy-Ni/MC, b) Ni/MC and La-Ni/MC

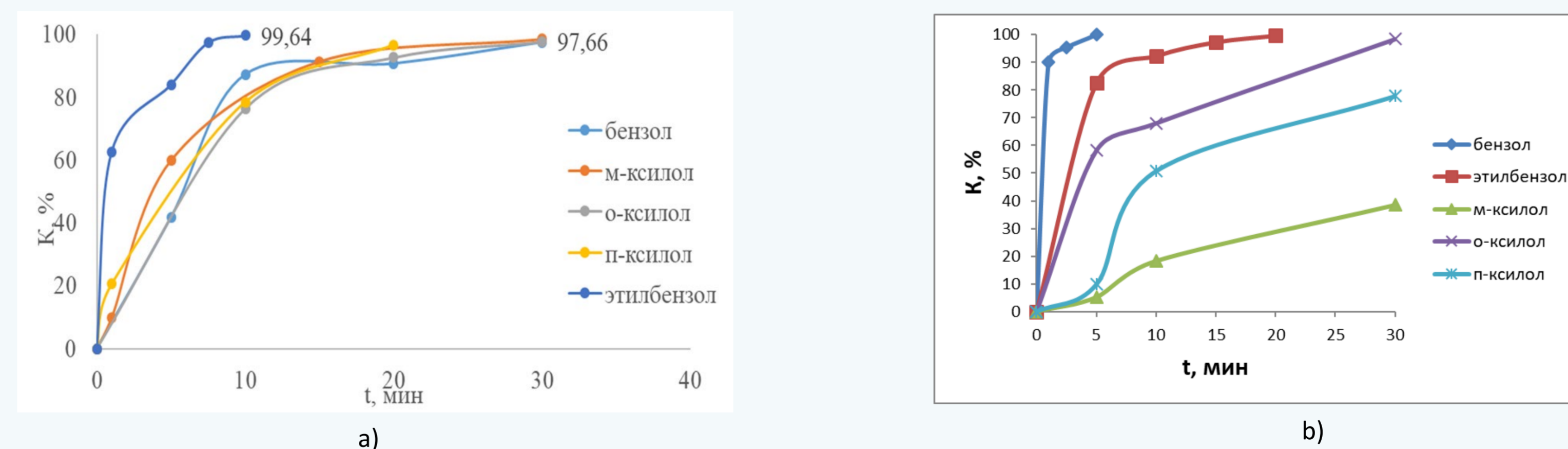


Fig.5. Dependence of conversion on hydrogenation time for benzene and its derivatives (3 atm and 170  $^{\circ}$ C) on catalysts: a) Dy-Ni/MC, b) La-Ni/MC

## CONCLUSIONS

It was found that the nature of the metal, both upon doping of the MC structure and upon modification, affects the catalytic properties of materials. Doping with dysprosium of mesoporous silica containing nickel leads to an increase in the catalytic activity of the catalyst in the hydrogenation reaction with respect to benzene and its derivatives. Upon doping with lanthanum, the catalytic activity of the sample modified with nickel increases upon hydrogenation of benzene, whereas upon hydrogenation of xylenes, it decreases.