

## Hydrodeoxygenation of glycerol into propanols over a Ni/WO<sub>3</sub>–TiO<sub>2</sub> catalyst

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### Catalyst characterization

#### XRD

The phase composition of the catalysts was examined by X-ray diffraction (XRD) analysis. XRD patterns were recorded using a DRON-2 diffractometer with Ni-filtered Cu K $\alpha$  radiation ( $\lambda = 0.1542$  nm) in a step scanning mode, with a step of  $0.02^\circ$  and a counting time of 0.6 s per step in the range of  $2\theta = 20\text{--}80^\circ$ . Identification of the phases was performed by the comparison of the position and intensity of the peaks with the data from the International Center for Diffraction Data.

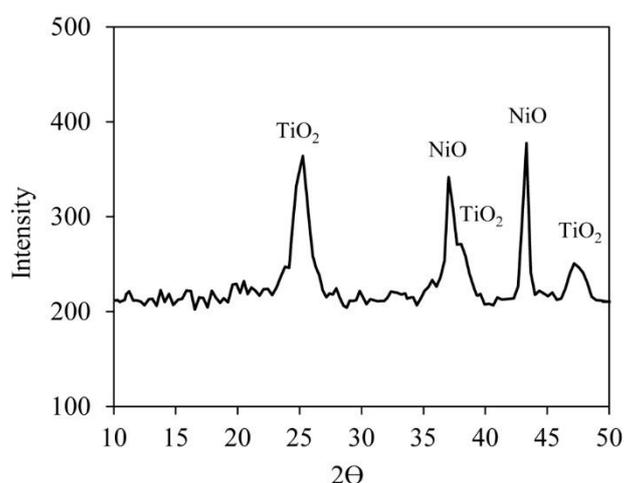
#### EDX

The elemental composition of the catalysts was determined using a scanning electron microscope SNE-3200M manufactured by SEC, combined with a system of the energy dispersive X-ray microanalysis QUANTAX manufactured by Bruker.

### Results

#### XRD

Figure S1 presents the XRD pattern of the 16%Ni/20%WO<sub>3</sub>–80%TiO<sub>2</sub> catalyst



**Figure S1.** The XRD pattern of the 16%Ni/20%WO<sub>3</sub>–80%TiO<sub>2</sub> catalyst. The size of NiO nanoparticles is 40 nm, the size of the TiO<sub>2</sub> nanoparticles is 18 nm.

The absence of reflexes belonging to the WO<sub>3</sub> phase in the XRD pattern of the catalyst can be explained by a low content of tungsten. It can be assumed that WO<sub>3</sub> oxide is present in the form of an amorphous phase distributed in the TiO<sub>2</sub> phase.

## EDX

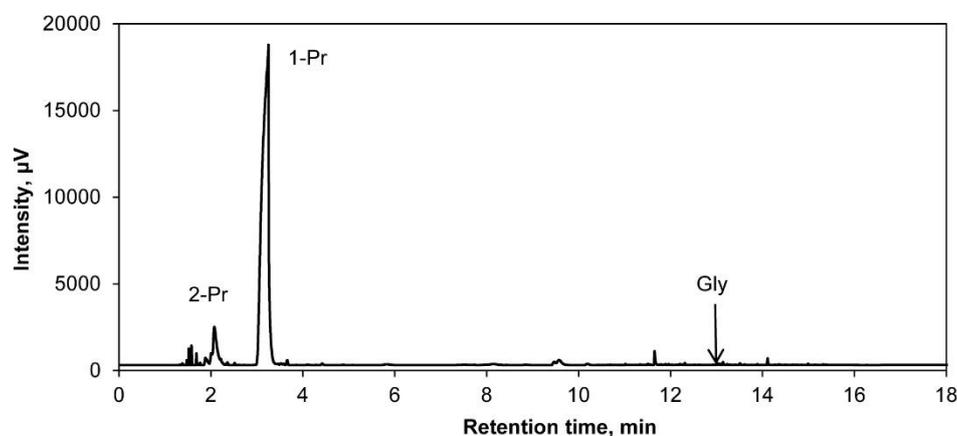
Table S1 presents the data on the elemental composition of the studied catalyst obtained by the energy dispersive X-ray spectroscopy (EDX). For comparison, the elemental composition of catalyst calculated on the basis of the amounts of nickel, tungsten, and titanium compounds used in their preparation is given as well.

**Table S1.** The composition of 16%Ni/20%WO<sub>3</sub>-80%TiO<sub>2</sub> catalysts.

Element	Calculated values		EDS data	
	% mass.	% at.	% mass.	% at.
O	29.8	65.3	28.4	64.2
Ni	15.3	9.1	17.2	10.5
Ti	28.0	20.5	26.0	19.7
W	26.9	5.1	28.4	5.6

## GAS CHROMATOGRAPHY

The analysis of the liquid samples taken during an experiment was carried out by gas-liquid chromatography using a capillary column with a FAPP-phase and a flame-ionization detector. GC analysis was carried out in a temperature programmable mode with a temperature rise from 50 to 210 °C. An example of the chromatogram of the products obtained under the optimal reaction conditions are given in Figure S2



**Figure S2.** The chromatogram of the products of the glycerol hydrodehydrogenation carried out over the 16%Ni/20%WO<sub>3</sub>-80%TiO<sub>2</sub> catalyst at 250°C and H<sub>2</sub> pressure of 3 MPa.