J. Chem. Chem. Eng. 9 (2015) 145-148
doi: 10.17265/1934-7375/2015.02.010

Getting and X-Ray Diffraction Analysis of the Microsphere Magnetic Catalyst of the Thorium-Uranium Catalyst for Fischer-Tropsch Synthesis

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Abstract: We first obtained by impregnating of the microsphere magnetic catalyst with salts of Thorium and of Uranium and examined the X-ray thorium-uranium catalyst for Fischer-Tropsch synthesis. Introduction in catalyst additive thorium and uranium ions and manganese improves the thermal stability of the magnetic microsphere catalyst.

Key words: Thorium, uranium catalyst, Fischer-Tropsch synthesis, catalysis.

1. Introduction

During the Second World War in Germany, the process on the basis of FT (Fischer-Tropsch) synthesis was used to produce gasoline and other hydrocarbon products. By 1944 in Germany there were 9 plants for Fisher-Tropsch-synthesis. By the method developed in Germany was first used catalyst consisting of cobalt, magnesium oxide, thorium oxide and kieselguhr, in the ratio of 100: 5: 8: 200. Later, most of the thorium oxide was replaced by magnesium oxide, and this was done for purely economic reasons. Currently, industrial plants FT-synthesis work in the union of South Africa. These plants use a precipitated iron-based catalyst, containing various promoters (Th, Co, Ni), enhance stability and improve the distribution of products.

The aim is to obtain X-ray diffraction analysis of the Thorium-Uranium catalyst for Fischer-Tropsch synthesis.

2. Experiments

Thorium-uranium catalyst for Fischer-Tropsch synthesis was prepared by impregnating salts of uranium and of thorium magnetic microspheres. Then, the thorium-uranium catalyst was dried in a drying oven to a constant weight.

3. Results and Discussion

Jeffrey T. Miller, Thomas D. Nevitt got cadmium- and thorium-containing catalyst [1], and showed a method of producing a thorium oxide-containing catalyst comprising: providing an alloy of thorium metal and at least one metal from the group consisting of nickel, cobalt and iron; oxidizing said alloy in an oxidizing atmosphere to oxidize said metals; and treating the oxidized material in a reducing atmosphere to reduce oxides of nickel, cobalt or iron to free metal to produce a catalyst containing thorium oxide and at least one metal from the group consisting of nickel, cobalt and iron. This catalyst has magnetic properties.

The object of the invention is to produce a catalyst consisting of mixed oxides of uranium under its 4th valence state and of thorium having a much greater activity than the known catalysts using either one of said elements.

Another object of the invention is to enable the

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inser-vtion of uranium in the stable lattice of thoria by substituting atoms of thorium by atoms of uranium in any atomic proportion, however not exceeding 35%, irrespectice of the average oxidation state of the uranium.

As is known, the spin catalysis is that the catalyst removes the ban on the spin reaction. Suppose that a geminate radical pair in the triplet state. As a rule, the radical pair can recombine only in the singlet state. Therefore, in this example, the radical pair recombination is possible only after the conversion of a pair of triplet spin state to the singlet. This conversion may be accelerated by the addition of paramagnetic. Spin-spin interaction of paramagnetic additives to alter the radical pair correlation of spins of unpaired electrons of the radical pair, thereby induce the singlet-triplet transitions in the radical pair. Thus, the paramagnetic additive acts as a catalyst radical pair recombination. If the radical pair starts from the singlet state, the paramagnetic additive reduces the probability of recombination of geminate radical pair, but also increases the probability of radical pairs of cells, paramagnetic additive acts as a catalyst for the collapse of the radical pair on independent radicals.

Spin catalysis, a stimulation of chemical reactions by changing the electronic angular momentum (spin) of the reactants. Its source is the fundamental law of conservation of spin: Allowed only those aspects of reactions in which the spin of products identical to the back of the reactants; all other reaction channels is strictly prohibited [2-10].

Physical meaning and purpose of the spin catalysis is to remove the spin prohibition to change the spin of the reactants and reaction channels open, closed on the back. These functions are performed by the spin catalyst – particles carrying its own electron spin (an atom, radical or ion). Interacting with the reacting system, the spin catalyst socializing their spin spin reacting system; in such a generalized spin system previously closed reaction channels are open, which is allowed to spin.

We decided to get of the microsphere magnetic catalyst—thorium-uranium catalyst.

In the physico-chemical laboratory uranium mines “Ak Dala” and “Uvanas”, the authors obtained thorium-uranium catalyst from uranium waste based on natural magnetic microspheres. Thorium-Uranium catalyst was prepared by impregnating the discharge of waste uranium solution of natural magnetic microspheres and obtained thorium-uranium catalyst for the chemical, oil and gas industry.

Analysis of the magnetic microspheres thorium-uranium catalyst was performed by X-ray microanalysis. Instrument: electron probe microanalyzer. Brand: Superprobe 733, Japan electron optics laboratories, Japan.

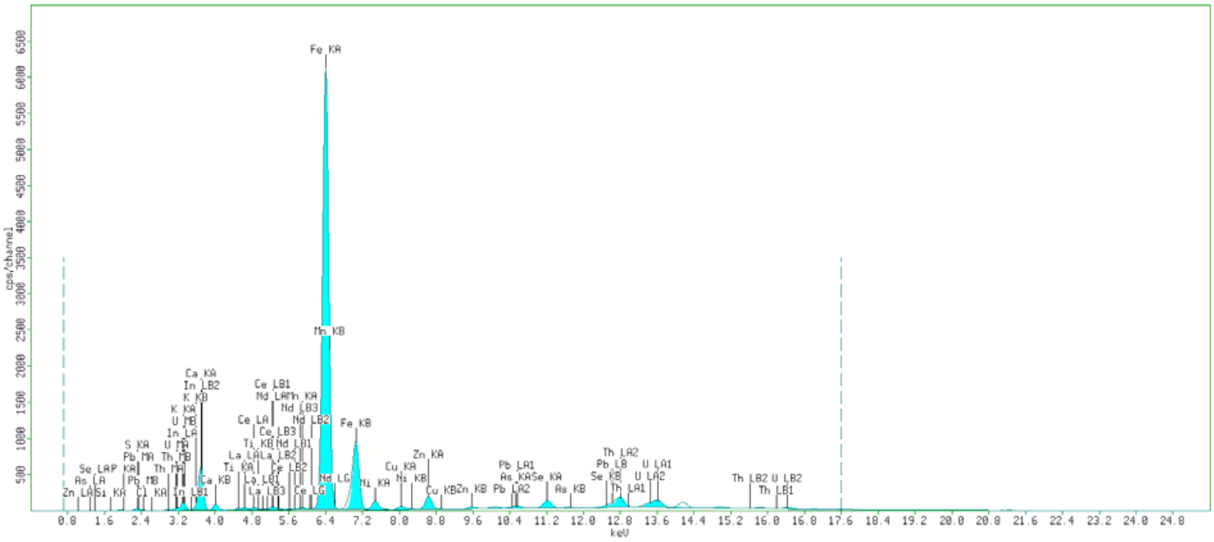
The analysis of the elemental composition of the resulting of the microsphere magnetic catalyst with salts of Thorium and of Uranium was performed using energy-dispersive spectrometer energy oxford instruments, England, established by electron probe microanalyzer Superprobe 733 at an accelerating voltage of 25 kV and a probe current of 25 nA.

Fig. 1 shows a thorium-uranium catalyst (U = 5.030%, Th = 0.030%).

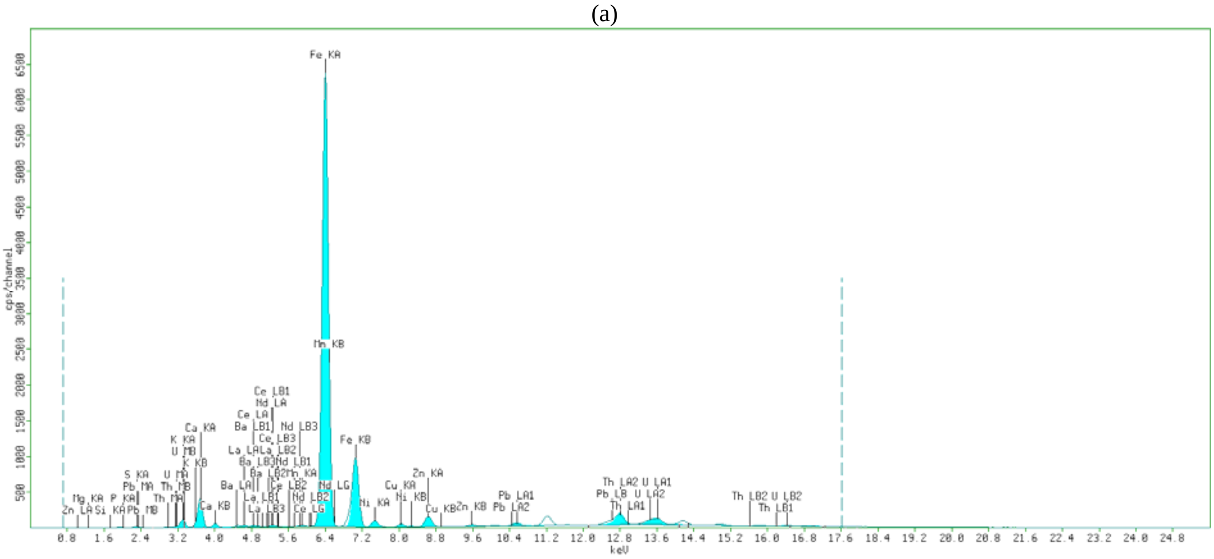
The results of elemental analysis of thorium-uranium catalyst are shown in Table 1.

As seen from the Table 1 and Fig. 1, thorium-uranium obtained catalyst contains U = 5.268%, Th = 0.030% and may be used as the catalyst for the chemical and petroleum industries. The microsphere magnetic catalyst of Thorium and of Uranium acts as a catalyst by contact with many organic synthesis. Thorium and Uranium catalyst is less sensitive to contact fastness than platinum catalysts.

It is found that the conversion organic compounds in thorium-uranium catalyst at low temperatures up to 400 °C for 5%-10% higher than that in the platinum catalyst, and the upper temperature limit of the effective amounts of at least 650 °C that corresponds to the best indicators of Thorium catalysts.



(a)



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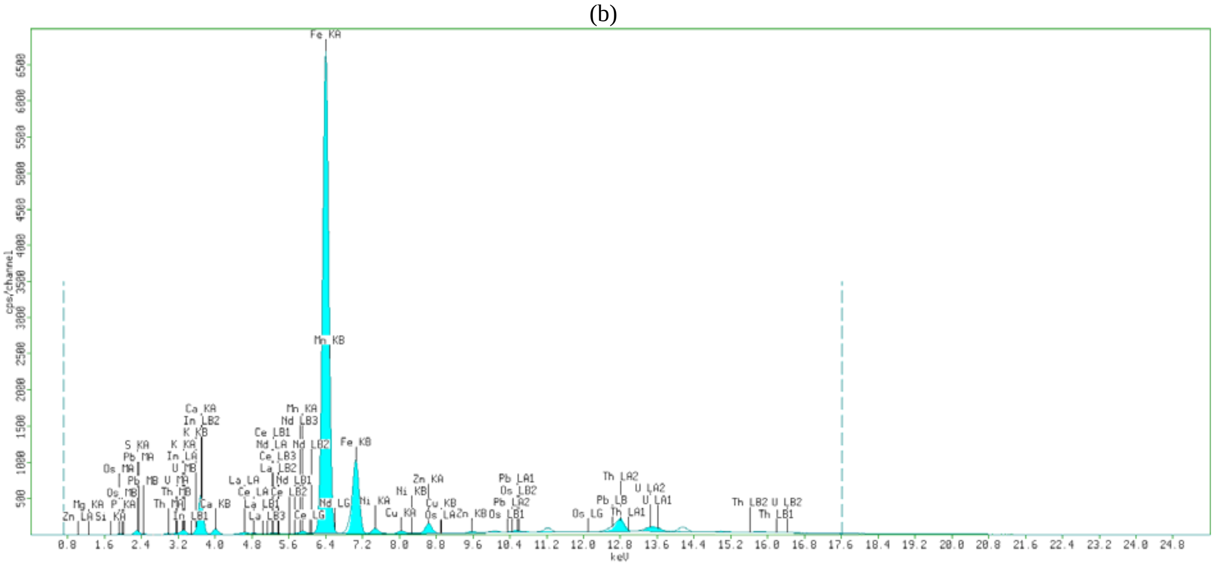

(c)

Fig. 1 X-ray spectrums of the magnetic microsphere catalyst of U, Th.

Table 1 The results of the elemental composition of the catalyst containing U, Th.

Compound	Si	P	S	Fe	Ni	In	La	Ce	Nd	Th	U
	0.223	0.254	2.079	20.286	0.405	0.146	0.151	0.563	0.200	0.030	5.268
Concentration (%)	0.184	0.414	1.489	24.000	0.371	-	0.212	0.341	0.162	0.030	5.681
	0.297	0.415	5.580	22.221	0.288	0.134	0.109	0.229	0.043	0.023	2.592

4. Conclusions

We got and X-ray Diffraction Analysis of the Microsphere Magnetic Catalyst of Thorium-Uranium catalyst for Fischer-Tropsch synthesis. Introduction in industrial catalyst additive thorium and uranium ions and manganese improves the thermal stability of the magnetic microsphere catalyst and can be used as a catalyst Fischer-Tropsch synthesis for the petroleum industry.

It is shown that spin catalysis using thorium-uranium catalyst may occur in heterogeneous hydrogenation, isomerization, oxidation on zeolites, metals, metal oxides.

Acknowledgments

The author would like to thank Lynn C. Francesconi (Hunter College CUNY), Peter C. Buns (Notre Dame University, Indians), Ruben M. Savizky (Columbia University, New York) and Chistopher L. Cahill (George Washington University) for discussion of the results.

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