Fig. 1. *Influence of contact time for the hydrocarbons concentration*

1.50; 2.50 ml/min to study the contact time effect on the depth of processing.

The contact time was calculated as the ratio of the bulk catalyst volume to the gas phase volumetric flow rate.

The liquid phase composition separated at the outlet of the reactor in the steady-state conditions was determined by gas chromatography in accordance with the requirements standard [2].

Figure below shows the contact time influence for the hydrocarbons concentration.

Based on the figure analysis it can be seen that increase in contact time provide increase in the feedstock processing depth, which is expressed

in a decrease in the concentration of paraffins and naphthenes (these groups react with the formation of aromatic and isoparaffinic hydrocarbons). The olefins concentration practically does not depend on the contact time and amounts to 2–4 wt %, i. e. are intermediate compounds. Thus, the main reactions during zeoforming are the feedstock isomerization and aromatization reactions. Cracking reactions also take place with the formation of olefins and light hydrocarbons, which are separated as a gas stream after the separator.

The obtained kinetic curves will be used in the development of a group kinetic model of zeoforming.

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APPLICATION OF COMPUTATIONAL FLUID DYNAMICS METHODS TO INTENSIFY REACTOR OPERATION IN THE CATALYTIC CRACKING PROCESS

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Gasoline is presently one of the most important products of oil-processing industry. It is mainly used as automotive fuel. According to experts [1],

its demand is forecast to climb. To increase gasoline products catalytic cracking is used. Catalytic cracking is the process in which long-chain hydrocarbons

are "cracked" into smaller molecules [2, 3]. Contacting the catalyst, vacuum distillates is converted into high-octane gasoline. Light olefins (ethylene and propylene) are the common products, which are widely applied in petrochemistry. Development and improvement of oil refining technologies can be achieved by computational modeling.

The aim of the work is to develop a practical tool for effective monitoring of an industrial catalytic cracking, limiting the complexity of the model to the level of available monitoring data.

The solution of the mathematical model is fulfilled with the use of the ANSYS FLUENT 2020 R2 environment. Geometry of an industrial lift reactor and mesh scheme are presented in Fig. 1, 2. The computational grid consists of 50656 nodes and 248741 triangular elements.

Fig. 1. *Industrial lift reactor*
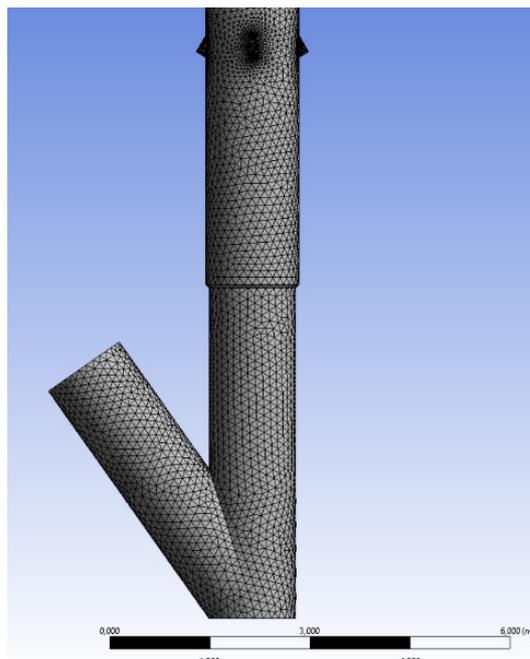
Fig. 2. *Mesh*
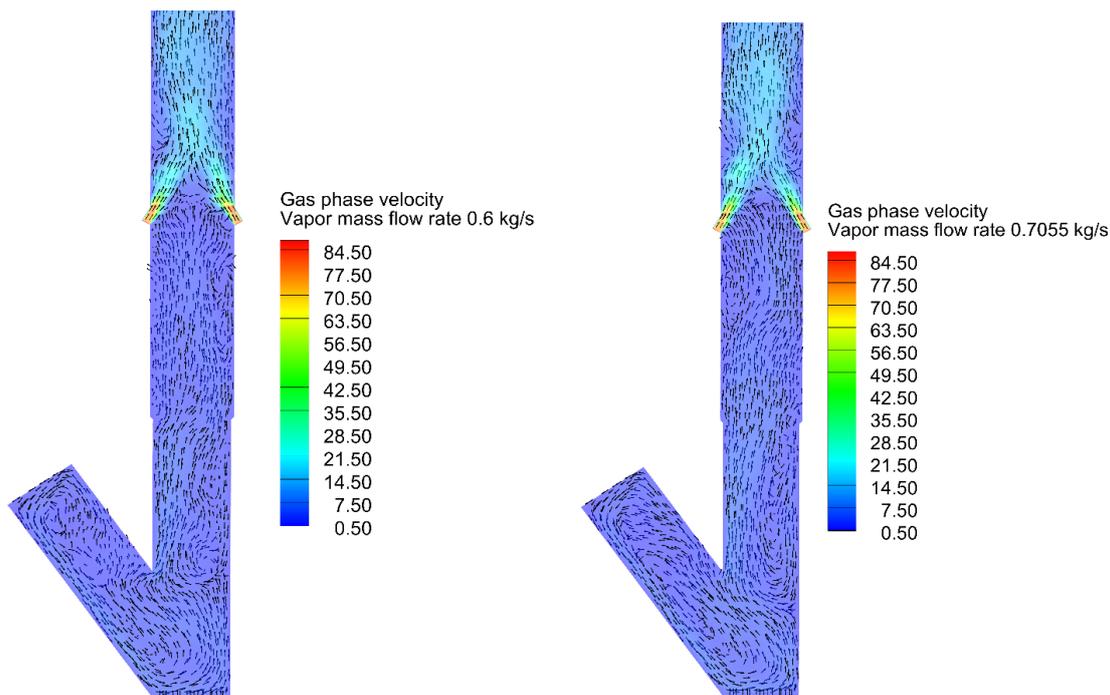
Fig. 3. *Gas phase velocity distribution contour (m/s) at different mass flow rate of water vapor*

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To simplify the description of catalytic cracking reactants with similar physicochemical properties were grouped into lumps. The four lumps of the model are the light gases (C1–C4), gasoline (C5–C12), gasoil (C13+) and coke (C24H12).The process is stationary in 50 seconds. Further calculations were carried out for 50 seconds. Gas phase velocity distribution contour (m/s) at different mass flow rate of water vapor is presented in Fig. 3.

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NOVEL TWO-STAGE METHOD OF PREPARING Br- AND I-DOPED C_3N_4 PHOTOCATALYSTS FOR HYDROGEN PHOTOPRODUCTION AND PHOTOCURRENT GENERATION UNDER VISIBLE LIGHT

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The photocatalytic hydrogen production is known to be a promising alternative way of hydrogen synthesis for energetic purposes [1]. From 2009, special attention was paid to graphitic carbon nitride which possessed suitable band positions, sensitivity to the visible light, and high chemical stability [2]. Its low catalytic activity was enhanced by improving the textural and electronic properties by doping with halogens. In literature there is much information about F- or Cl-doping, while Br- and I-doping were used rarely. The aim of our work is to study the Br- and I-doped photocatalysts for hydrogen production and photocurrent generation.

The photocatalysts were synthesized by a two-stage method. At the first stage, the mixture of melamine, glucose, and water underwent an ultrasound and hydrothermal treatment, for 30 min and for 12 h at 180 °C, respectively. At the second stage, the obtained melamine and ammonium bromide or ammonium iodide was calcined at 550 °C for 2 h [3]. Before testing the photocatalytic properties, 1 wt. % of Pt was deposited on the photocatalyst surface. The prepared photocatalysts were denoted as 1% Pt/y-X, where X was Br or I, y was the weight content of corresponding ammonium halide. All prepared samples were studied by a set of methods.

Their photocatalytic properties were investigated in the aqueous solution of triethanolamine with sodium hydroxide under irradiation with a diode (λ = 425 nm). The photoelectrochemical characteristics were obtained in a two-electrode cell [2] with the same light source.

The XRD analysis confirmed the formation of graphitic carbon nitride due to the presence of two typical peaks at 13 and 27 degrees which corresponded to (100) and (002) planes, respectively. The surface area of pristine carbon nitride was 11.2 m^2/g. The addition of ammonium iodide to melamine led to the linear increase in the photocatalysts' textural properties. The highest values of the surface area and pore volume were achieved for 1 % Pt/50-I and equaled 45 m^2/g and 36 cm^3/g. In the case of ammonium bromide, the contradictory trend was observed. The thermal decomposition of the mixture containing ammonium bromide and melamine occurred if $w(NH_4Br)$ was greater than 50 %. These samples possessed higher values of the target processes. All analyzed photocatalysts absorbed visible light and were potentially active photocatalysts. The absorption edges were the same within the experimental error for all samples. The prepared samples were studied by SEM and elemental mapping. The