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## RADIOTRACER INVESTIGATIONS ON SELECTED CHEMICAL INSTALLATIONS

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Tracer investigations of media transport through chemical reactors play a significant role in chemical technology. They provide a basis for determination of some important process parameters, such as flow character of the transported medium, degree of utilisation of the reactor volume during chemical transitions of substrates or even indicate possible mechanisms of chemical reactions. Determination of the medium flow characteristics is closely connected with mathematical description of the process, the mathematical model of transport.

In tracer investigations of mass transport, proper selection of the tracer is of paramount importance thus becoming a specific task to be solved at the stage of detailed planning of the experiment.

In the case of radioactive tracers it is necessary to take into account the type and energy of the radiation emitted. Moreover, it is recommended that the final assessment of a radiotracer suitability for a given purpose be made on the grounds of testing its properties under actual conditions of the process to be investigated. The method of assessment of radiotracers' suitability for investigation of distillation processes presented in [1] allows to determine, in a simple manner, the parameters of distillation characteristics of the radiotracers, the average distillation temperature, a range of distillation temperatures, suitable radiochemical purity. These parameters precisely determine the behaviour of tracers to be expected in a wide range of variable conditions of the distillation process. Application of radiotracers tested in such a manner to investigations of hydrodynamics of industrial rectification columns has resulted in obtaining a dependable evaluation of those columns' performance in a wide range of changes of their operational parameters.

The adopted methodology has been presented on the example of radiotracer investigations of the liquid phase dynamics in a plate rectifying tower under operation at the Chemical Works "Oświęcim".

Particular attention has been paid to dynamics of the liquid phase on the column plate. A dispersion model of liquid flow with hold-up zones has been proposed for description of the liquid phase transport in the plate - overfall assembly. The model consists of a number of flow and stagnant zones, with mass transfer occurring between them. Different cases of model equations have been analysed, depending on the location of the points of measurement of the tracer concentration distribution. Also different values of mass transfer coefficients between the zones have been considered.

Another example of practical application of radiotracer investigation results is the analysis of phase dynamics in installations designed for the process of liquefaction of Polish coals by means of their catalytic and non-catalytic hydrogenation. For the analysis of phase transport in a reaction vessel various mathematical models were applied with the purpose of obtaining the best match of the mathematical description for the actually observed hydrodynamics.

The adapted mathematical model of transport of substrates through the reaction vessel was then combined with the kinetics of the hydrogenation process to obtain the degree of conversion of the carbon substance contained in the coal [2].

The investigation techniques and methods of interpretation of the tracer experiments described in this paper can be used for the analysis of operation of chemical industry apparatus, particularly in the cases when their operational parameters (high temperature and/or pressure) do not permit usage of other than radiotracer investigation techniques.

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## DEGRADATION OF VOLATILE ORGANIC COMPOUNDS EMITTED FROM COAL COMBUSTION BY ELECTRON BEAM TREATMENT

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In Poland energy is produced mostly in coal power stations and contemporary fossil fuel combustion is

known as a main source of gaseous pollutants emitted into the atmosphere. The most harmful compounds



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