Списък на резюмета на научната продукция извън дисертацията
на
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T. Petrova, E. Toshev : Numerical Study of Axisymetrical Flow Past a Hollow Cylinder, *Journal of Theoretical and Applied Mechanics,* Sofia, Year XXIII, № 2, (1992), 155 – 160.

Abstract : The granulated catalysts are very important for many different chemical technologies. For such kind of catalysts the size of their surface is the main factor for the activity of the catalyst particles. In that reason the particles, having shape as a piece of tube are often used in numerous chemical technologies and usually are called Raschig rings. The purposes of the present investigation is to study the axisymmetrical flow past a hollow solid cylinder with finite length and finite thickness of the wall. The considered solid particle imitates a single Raschig ring. The model of the flow is based on the incompressible 2D Navier-Stokes equations in terms of stream function – vorticity.

By using both the ADI and over relaxation methods, the distribution of the stream function and vorticity has been obtained. For several values of Reynolds number, the flow pattern and the drag force, induced over the particle, are obtained.

E. Toshev, T. Petrova : Numerical Study of an Axial 2D Flow past a Cylindrical Particle, *Proceedings of the Eighth Conference on Numerical methods in Laminar and Turbulent Flow*, Swansea, UK, 18-23 July, vol.VIII, Part 2, (1993), 1670 –1681, *Edited by C. Taylor.*

Abstract : By using the finite difference methods for solving the 2D Navier-Stokes equations in normal or doubly-connected domain the flow past a particle of a special type is numerically simulated. The shapes of the particle is a solid cylinder with finite length or a hollow cylinder with finite both length and thickness of the wall. Such kind of particles is often used as catalyst pellets. The flow considered is axial to the particle and is inducted by an axial and uniform at infinity flow.

By numerous numerical experiments the flow patterns and the flow characteristics are obtained. The drag coefficient and the flow rate delivery through the particle hole (in the case of hollow cylinder) dependence on the Reynolds number and the length of the particle are investigated. The results for the Reynolds number within the interval from 1 to 100 and the length of the particles within the interval from 0,5L to 8,5L (L is the thickness of the cylinder wall) are obtained for hollow cylinder. In the case of solid cylinder the particle length varied within the interval from 0,5L to 4,25L (L is the radius of the particle).

By visualization of the flow the evolution of the stream close to the particle and the stagnation zone behind it are shown. The interesting effect connected with the existing of a minimum of the drag coefficient as a function of the particle length for a fixed Reynolds number is received.

E. Toshev, T. Partalin, T. Petrova : Numerical Study of the Flow- Partical Interaction, *Journal of Theoretical and Applied Mechanics,* Sofia, vol. 27, № 3, (1997), 39 – 50.

Abstract : By using a numerical simulation method, based on solving of 2D Navier- Stokes equations, the incompressible flow past a single particle or a pair of particles are investigated. In the case of two particles, the spherical particles in tandem are considered. The flow around the spheres is inducted by uniform at infinity flow, parallel to their center line. The velocities distribution and drag coefficients are found for different values of Reynolds number Re (from 1 to 100), and different distances between the particles L (from 0.125 to 20 radii). In the case of single particle two different types of particles are considered. First type is the case when the particle is in the shape of solid cylinder and the second type is the case of hollow cylinder. The represented results are for values of Reynolds number Re from 1 to 100, and particle length F from 0.5 to 8.5 character lengths for hollow cylinder, and from 0.25 to 4.25 character lengths for solid

cylinder. By using the smoke wire visualization technique the flow around the hollow cylinder particle, or a pair of spherical particles is shown.

L. Ljutzkanov, N. Kolev, T. Petrova : Pressure Drop of Porous Wall Tubes in Case of Contracting Fluids, *Bulgarian Chemical Communications*, vol. 34, № 2, (2002), 162-169.

Abstract : Recently a new type of apparatus for carrying out adsorption and catalytic processes was proposed. The fluid flow enters directly and only through the porous wall of the tubes , which leads to elimination of the diffusion resistance of the processes. A mathematical model for calculating the pressure drop of the cylindrical wall of the tubes in case of contracting fluid is presented. Experimental data for several porous materials are given.

Р. Даракчиев, Т. Петрова, С. Даракчиев: Разпределение на газа в колони със съвременни насипни пълнежи, *Сборник доклади от Енергиен форум 2004*, Варна,11-13 юни, т.I, (2004), стр. 53-57.

Abstract : The work presents results of a study on gas distribution in the largest sizes of random packings of type IMTP – Ring metal, Raschig Super Ring – metal and Ralu Flow – plastics rings. The uniformity limit and penetration depth of the packings are determined. It is shown that after reaching the uniformity limit, the maldistribution factor does not get worst for the most of packings. The conditions are stated for their use in energy plants for water treatment and gas cleaning.

L. Ljutzkanov, N. Kolev, T. Petrova : Investigation of porous wall tubes made of activated carbon, *Proceedings of 10th International Summer School of Chemical Engineering*, Varna, 24-31 May, 2004, (2004), 186-189, *Edited by Ts.Sapundzhiev and R. Popov.*

Abstract : A solution has been proposed for eliminating the diffusion resistance by proper structuring of the active carbon as a support of catalysts obtained by the appropriate polymer mixtures. A structured carbon has been obtained in the form of pipes corked from the one side and then joined together on a grid in the body of the contact apparatus. After material activation a thick-walled tubes, plugged from their one edge are received. The investigated activated carbon pipes with different permeability and adsorption properties are obtained; they are prepared by pyrolysis of tubes formed from thermoreactive resin and different fillings as wood meal and activated carbon. The characteristics of the carbon tubes after thermal treatment and experimentally obtained values of constants of permeability and tube porosity are determined. The proposed catalyst tubes have relatively high permeability at practically low pressure drop. Above mentioned constants vary in the activation process and become lower with increasing the iodine adsorption capacity, depending from their specific surface. The newly obtained are applicable in all branches of chemical industry.

T. Petrova, Kr. Semkov : Mathematical modeling of single-phase flows in packed-bed columns, *Proceedings of 11-th Workshop on Transport Phenomena in two-phase flow*, Sunny beach resort, Bulgaria, September 1-5, 2006, (2006), 93-106, *Edited by J. Hristov.*

Abstract : Dispersion models for simulating the radial maldistribution of single-phase flows in packed-bed columns have been developed. Two cases for their application on liquid phase, spreading over random packing in the column, were considered: respectively with and without wall flow deflecting rings, mounted on the column wall to restrict a wall flow. Model parameters have been identified with the help of experimental data by non-linear optimization of minimum of residual variance between the model and experimental values. It was proposed to describe the radial gas maldistribution in packed column by means of dispersion model too. On this model's solution bases an additivity of gas redistribution abilities for both packing layer and preceded gas distribution device is proven. The theoretical relationship for maldistribution

factor explaining the development of maldistribution factor along the packing layer's height has been worked out. The models are checked up on an experimental data for structured and random packings.

T.Petrova, S. Darakchiev, R. Darakchiev: On the distribution ability of random packings, *Bulgarian Chemical Communication*, 39 (1), (2007), 15-19.

Abstract : The results of studies on gas distribution in columns with packings of Raschig –Super Ring – metal and plastic, metal IMTP-Ring as well as plastic rings Ralu-Flow are considered. The shape of the packing and the existence of geometrical similarity are discussed. A generalization of experimental results for the maldistribution factor is being searched. The pressure drops of the studied packings are measured at 2 m/s gas flow velocity. It is shown that a packing layer can be regarded as a flat grid because both of them have similar distribution ability. The values of resistance coefficient and degree of damping characterize the flat grid. The resistance coefficient is calculated for a packing layer of thickness equal to the penetration depth, using experimental pressure drop data. By analogy with flat grid, the quantity "degree of damping" of packing layer is defined. An analysis of both quantities has shown that a degree of damping 15 – 25 % from the initial maldistribution, can be attained at mean resistance coefficient * = 0,71.

Petrova T., R.Darakchiev, K.Semkov, S.Darakchiev : Estimations of gas flow maldistribution in packed-bed columns, *Chem. Eng. Technol*., 31 (12), (2008),1723-1729. (REVIEW)

Abstract : A review of articles dealing with estimation of the rate of gas flow maldistribution in packed-bed columns is presented. The proposed relations for determination of the maldistribution factor are given along with the conditions at which they are obtained. It is shown that the indices of maldistribution are usually based on particular terms, i.e., variation coefficient, dispersion or standard deviation. However, they cannot be regarded as a single indicator of gas maldistribution if the gas flow irregularities are not homogeneously distributed over the cross-section. There is no unified methodology for measuring of gas flow velocity profile. Schemes for measuring of velocity profiles, as well as equations for calculation of maldistribution factor are recommended.

T. Petrova : Application of Bessel functions in the modelling of chemical engineering processes, *Bulgarian Chemical Communications*, 41 (4), (2009), 343-354. (REVIEW)

Abstract : It was shown, that under given conditions the differential equations, describing some kind of transfer processes, allow an exact solution, expressed by Bessel functions. For that purpose a wide range literature survey, covered the modelling of transfer processes in chemical engineering as well as in the related fields, was done. The typical examples from hydrodynamics, heat transfer, diffusion, bioprocesses and so on, were considered and discussed.

Татяна Петрова, Крум Семков, Симеон Даракчиев Румен Даракчиев : Разтичане на течността в колони с ненаредени пълнежи, *Научни трудове на УХТ –Пловдив*, том.LVI, свитък 2, (2009), 245-250, редакционна колегия Костадин Василев и членове.

Abstract : Въз основа на всички открити до момента данни за коефициента на разтичане за конвенционални и съвременни насипни пълнежи, е направен анализ на влиянието на структурата и размерите на пълнежа, както и на начините за определянето на D, върху стойността на D . Установено е, че колкото е по-отворена структурата на пълнежния елемент, толкова повече D намалява, а в отделни случаи и спира да зависи само от основния (номинален) диаметър на пълнежа.

Румен Даракчиев, Татяна Петрова, Крум Семков, Симеон Даракчиев : Разтичане на течността в колони с пълнеж „Пчелна пита”, *Научни трудове на УХТ –Пловдив*, том.LVI, свитък 2, (2009), 251-255, *редакционна колегия Костадин Василев и членове.*

Abstract : Изследван е коефициентът на разтичане D на блоков керамичен пълнеж “Пчелна пита”, като показател за разтичащата способност на пълнежа. Изследвани са както прави блокове и такива с различен наклон, различен размер на шестоъгълните отвори и различна височина. Показано е, че силно влияние на коефициента оказва ъгъла на наклона и диаметъра на вписаната окръжност в шестоъгълните отвори.

Tatyana Petrova, Simeon Darakchiev, Krum Semkov, Rumen Darakchiev : Method for estimation of the gas phase maldistribution in packed bed columns”, *Journal of International Scientific Publication: Materials, Methods & Technologies*, v.4, Part 2, (2010), 323-332.

Abstract : A detailed analysis of the gas phase maldistribution in packed bed column is carried out based on the experimental data for some random and structured packing at different packing heights. The maldistribution is expressed by the maldistribution factor, calculated from the radial velocity profiles sampled by different number of measuring points. It is shown that by increasing the number of measuring points over the column cross-section the gas maldistribution factor increases gradually but after a definite number of points it does not change more - a “plateau” is reached. This number of the sampling points, respectively the size of the sample area determines the scale of the registered maldistribution – large or small one. This way the different scale maldistributions and the zones where they appear could be identified.

Татяна Петрова : Сравнение на разпределителната способност на слой пълнеж и газоразпределителни устройства на базата на дисперсионния модел, *Сборник доклади от Лятна школа за докторанти, постдокторанти и млади учени “Химични и биохимични технологии и опазване на околната среда”*, 6-8 юли 2010, Бургас, (2010), стр.1-6, на CD, редактор Желчо Стефанов.

Abstract : Comparison between the ability of the packing layer or of gas distribution device (GDD) to ensure both the uniformity of the gas passing through them and a low pressure drop has been made. Experimental data on the gas velocity profiles in an apparatus with a diameter of 0,47 m, measured after 2 different GDD and 15 various types of packings have been used. For each of packings the pressure drops were measured in the layer heights from 0 to 0,8 m. Furthermore, the results of the model description of the distribution of gas flow in packed columns and GDD, obtained by the dispersion model were used.

It was found that both the redistributive ability of the packing layer and the pressure drop through it depends on the type, size and structure of packing. Structured packing "Honeycomb" distributed gas flow better than investigated high-effective random packings. Highest pressure drop of the investigated random packings is obtained for IMTP (smallest and largest size), followed by RSRM, RSRP, and RF. However, their ability to correct bad initial distribution is good (up to 30% maldistribution). Of the two types of GDD the lower pressure drop creates a ring-GDD, however, after both GDDs the maldistribution factor of gas flow is still very high (50-60% maldistribution).

Татяна Петрова : Изследване и оценки на скоростен профил на газово течение и хидравлично съпротивление в колонни апарати с пълнеж, *Сборник доклади от XV-та научна конференция с международно участие - ЕМФ`2010*, том II, (2010), стр.72-77, редакционна комисия Б.Бонев и членове.

Abstract : Направено е сравнение на способността на слой пълнеж или газоразпределително устройства (ГРУ) да осигурява както равномерност на преминаващият през него газов поток, така и ниско хидравлично съпротивление. Използвани са експериментални данни , получени в колона с

диаметър 0,47 м, за скоростните профили на газов поток и хидравличните съпротивления, измерени след два вида ГРУ и 15 различни типове пълнеж. Данните за оценката на разпределителната способност на слой пълнеж и ГРУ са получени от дисперсионния модел.

Tatyana Petrova, Simeon Darakchiev, Krum Semkov, Rumen Darakchiev : Methods of approach for reducing the maldistribution in packed columns by dividing the packing into sections, *Transactions of Academenergo*, 1, (2011) 31-40.

Abstract : The uniform gas and liquid distribution on the packed column cross-section is pivotal for their effective work. Both liquid and gas has tendency to form wall flow at their counter current motion, therefore a distortion of the liquid-gas ratio both on the cross-section and in the height of the apparatus appears. To solve this problem, most often the packing layer (needed for process implementation) is divided into sections. In this work methods for determination of these segments' heights are presented and the flow distribution along this height is demonstrated.