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A New Approach to Modeling and Simulating of Mass Transfer Processes in Industrial Column Apparatuses

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The diffusion boundary theory is not applicable for the modeling of chemical, absorption, adsorption and catalytic processes in column apparatuses, where the velocity distributions and interphase boundaries are unknown. The use of the physical approximations of the mechanics of continua for the interphase mass transfer process modeling in industrial column apparatuses is possible if the mass appearance (disappearance) of the reagents on the interphase surfaces of the elementary physical volumes (as a result of the heterogeneous reactions) are replaced by the mass appearance (disappearance) of the reagents in the same elementary physical volumes (as a result of the equivalent homogenous reactions), i.e. the surface mass sources (sinks), caused by absorption, adsorption or catalytic reactions must be replaced with equivalent volume mass sources (sinks). The solution of this problem is related with the creation of new type of convection-diffusion and average-concentration models (Chr. Boyadjiev, M. Doichinova, B. Boyadjiev, P. Popova-Krumova, Modeling of Column Apparatus Processes (Second Edition), Springer-Verlag, Berlin Heidelberg, 2018). The convection-diffusion models permit the qualitative analysis of the processes only, because the velocity distribution in the column is unknown. On this base is possible to be obtained the role of the different physical effect in the process and to reject those processes, whose relative influence is less than 1%, i.e. to be made process mechanism identification. The average-concentration models are obtained from the convection-diffusion models, where average velocities and concentrations are introduced. The velocity distributions are introduced by the parameters in the model, which must to be determined experimentally.

Biography:

Christo Boyadjiev completed his PhD in the year 1968 at the USSR, Moscow Institute of Chemical Mechanical Engineering. He worked as an Associate Professor in the year 1971. He also worked as a Professor in Chemical Engineering, since 1981. He is the Chairman of the Organizing Committee of the Workshop on "Transport Phenomena in Two-Phase Flows" (No.1 - 15). He is also the Chairman of the Scientific Council of the International Scientific Centre for Power and Chemical Engineering Problems (<http://www.int-sci-center.bas.bg>).