MATHEMATICAL MODELLING OF HEAT TRANSFER IN PACKED BEDS

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In the report we model three problems. The first one is the "homogeneous" flow model [1], the simplest approach to the problem, the two phase flow is assumed to be a single phase flow having pseudo properties arrived at by suitably weighting the properties of the individual phases. The main difficulty in particular problem is to solve Dirichlet boundary problem for Poisson equation

$$\Delta u(x, y) = f(x, y), \ \ (x, y) \in D,$$

∂D is boundaries of the domain D with the boundary conditions on $\partial D : u(x, y)|_{\partial D} = c(x, y)$. The multiply connected domain D and interior separation lines are the main challenges [2, p.167].

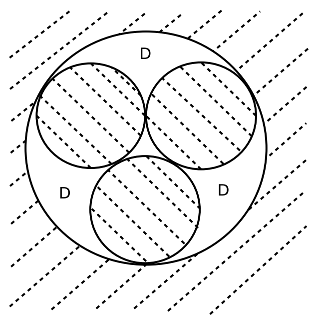

Рис. 1: Packed beds: example of the domain D

The second problem concerns the "separated" flow model. In this approach the two phases of the flow are considered to be artificially segregated. Two sets of basic equations can now be written, one for each phase. The information must be forthcoming about the flow area occupied by each phase and about various kinds of interactions at the interface. This information is integrated into the basic equations on the basis of simplified models of the flow. The third one addresses the "flow pattern" models. In this more sophisticated approach the two phases are considered to be arranged in one of several prescribed geometries. These geometries are based on the various configuration of flow patterns found when both the phases are flowing together. The basic equations are solved within the framework of each of these idealized representations. In order to apply these models it is necessary to know when each should be used and to be able to predict the transition from one pattern to another.

REFERENCES

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2. G.E. Forsythe, W.R. Wasow *Finite-difference methods for partial differential equations.* John Wiley and Sons, INC New York - London, 1963, p. 1-487.