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Theoretical models for trace gas preconcentrators JIHYUN KIM, University of Southern California — Muntz et al., in 2004 and 2011, had attempted to describe theoretical models about the shape of a main flow channel and the concentration ratio of trace gas for a Continuous Flow-Through Trace Gas Preconcentrator by concepts of net flux and mass flow rate respectively. The possibilities were suggested to obtain theoretical models for the preconcentrator even through they were not satisfied with experimental results, because the theoretical models were only considered for free molecular flow. In this study, new theoretical models based on net flux and mass flow rate have been applied for each regime; free molecular flow, transition flow, and hydrodynamic flow. There are comprehensive numerical models to describe entire regimes with the new theoretical models induced by mass flow rate, but the new theoretical models induced by net flux can be only obtained for the hydrodynamic flow. The numerical predictions were compared with existing experimental results of the prototype of the preconcentrator. The numerical predictions of hydrodynamic and transition flows by mass flow rate were close to the experimental results, but other cases were different to the experimental data. Nevertheless, the theoretical models can provide the possibility to develop the theory of preconcentrator.

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