Unsteady State Multi-stage Binary Mixture Distillation: Simulations and Experiments

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We carried out unsteady state experiments of multi-stage distillation of ethanol-water mixture. Using the material balances, energy balances and thermodynamic relations of component liquids and vapors, together with transport coeffcients, we computed transient behavior of the top and bottom products compositions and flow rates together with temperature distribution for a given set of operation parameters. The operation parameter vector includes tank heater power, coolant flow rate, feed preheating, reflux preheating and reflux rate. When there is a sudden change in the operation parameter vectors, different transient behaviors emerge, which was measured experimentally and computed using finite element method. We compared the computed results with experimental results to verify the models and its accompanying assumptions.