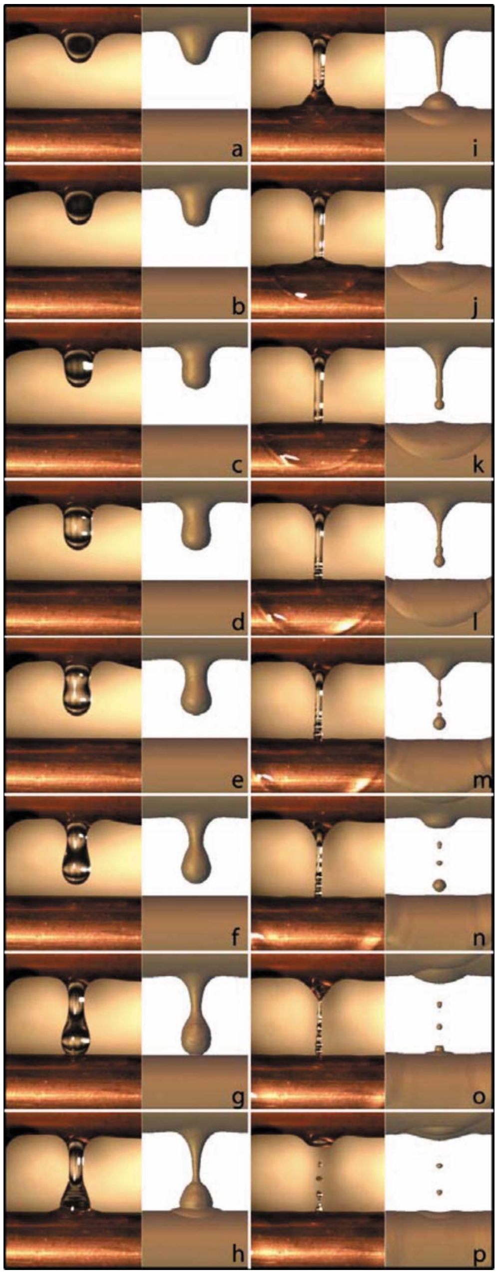
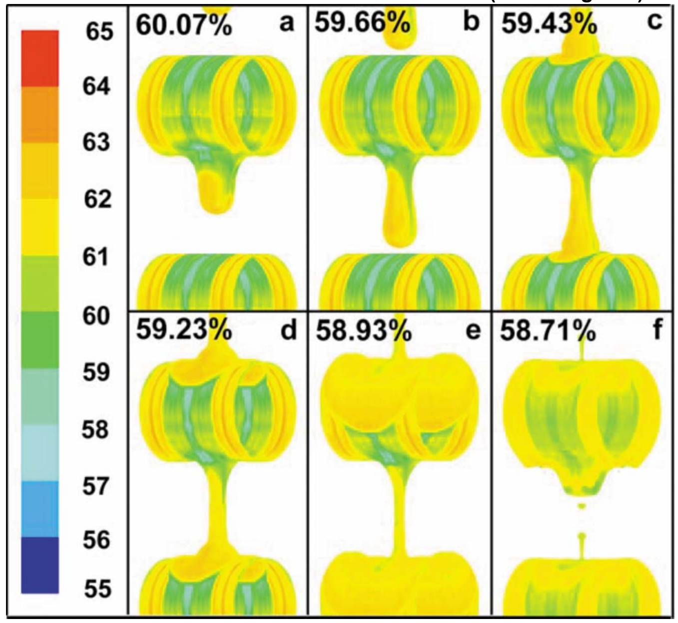
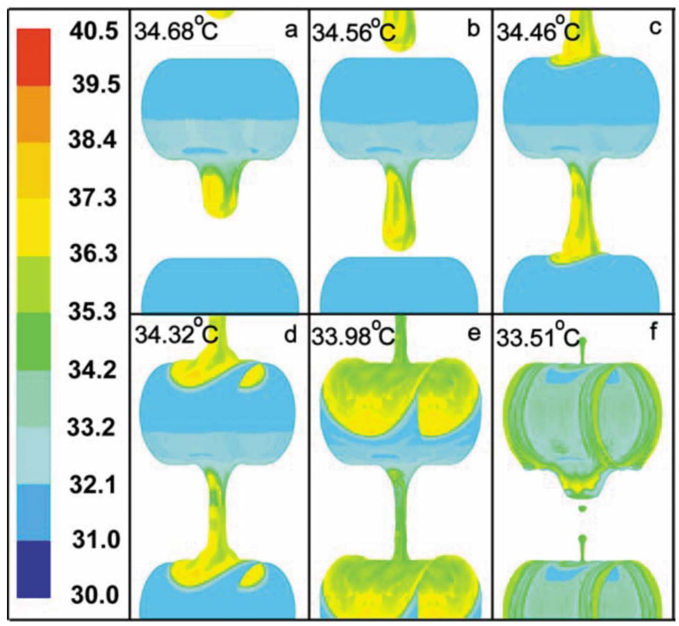
Flow Patterns: Experiments and Computations



LiBr-H_2O Solution Concentration Distribution (LiBr Weight %)



LiBr-H_2O Solution Temperature Distribution (°C)



Computational Analysis of Binary-Fluid Heat and Mass Transfer in Falling Films and Droplets

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Heat and mass transfer models in the literature on horizontal-tube absorbers make simplistic assumptions about fluid flow patterns. High-speed flow visualization was used to show that inter-tube flow occurs as droplets, and the formation and detachment of these droplets and their impact on the tube have significant effects on heat and mass transfer. Most models neglect these flow modes and assume the solution to flow as a uniform film. The present study numerically models heat and mass transfer in the absorber taking the realistic drop-wise and wavy film flow mechanisms into consideration. The impact of droplets on the tube causes the lithium bromide solution film on the tube to mix and present newer regions of the solution for vapor absorption. The impact also gives rise to waves that propagate axially over the liquid film on the tube. The mixing effect and the waves caused by droplet impact play a very important role in the heat and mass transfer. Results obtained from this study will lead to better understanding of the vapor absorption process, and yield more efficient and optimal absorber designs.

