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## Flow regimes during condensation in superheated zone

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### Highlights

Paper presents data and visualization verifying the existence of a condensation in superheated zone for R134a in a horizontal smooth tube. The videos are obtained in a **diabatic** section showing condensation starts as droplets, rivulets, and a very thin film. In addition film thickness measurements were conducted and they further support the trends seen in the videos. Insights gained from these experiments enable the development of a physically-based model of the early stages of condensation.

### Abstract

Heat transfer experiments with flow visualization were performed with R134a in a smooth horizontal tube in order to verify that condensation occurs outside the two-phase region. The visualization performed for this work is unusual in that a diabatic visualization section was used, more closely approximating the behavior of the fluid in an actual condenser than typical adiabatic visualization experiments. In addition to the flow visualization, liquid film thickness measurements were taken and used to determine the cumulative latent heat transferred from the refrigerant. The measured film thicknesses and recorded videos confirm the presence of liquid in the bulk superheated region. Condensate appeared first as droplets and rivulets on the tube wall and then formed a thin film. The flow later passed through misty annular and wavy flow regimes as the refrigerant transitioned to the two-phase region.

### Keywords

Flow regimes; Condensing superheated; Two-phase flow; Film thickness; Visualization

### Nomenclature

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