

Studies on Falling Film Evaporation

Shigeki Toyama, Masaaki Nakamura and Kazunori Murase

(Dept. of Chem. Eng., Nagoya University)

Summary

Heat transfer enhancing surfaces with grooves or fins have been developed and contributed in advancement of sea water evaporators. While, the mechanism of the heat transfer enhancement has not been quantitatively clarified. In this study, shape and stability of falling film was theoretically analyzed and the application to desalting evaporators was investigated.

Force balance equations of a liquid film formed between two spheres (meniscus) was formulated by referring the Scriven's paper, and the shape and stability of the meniscus were calculated by finite element method. The result proved that the meniscus shape could be approximated by rotating bodies or axial symmetry and critical sizes to lost stability after deforming due to gravity force were estimated by attributing the eigenvalue problem.

Calculated results were apply to design triangle grooves below the roof for a solar desalting still. The designed apparatus has successively tested to provide useful data for developing the proposed system.