

Free Boundary Problems for Parabolic Equations II. Evaporation or Con- densation of a Liquid Drop

AVNER FRIEDMAN

Communicated by H. LEWY

TABLE OF CONTENTS

Introduction	19
1. Statement of the existence theorem	21
2. The integral equation	23
3. Existence and uniqueness for small times	25
4. Existence and uniqueness for all times in case of condensation	33
5. An <i>a priori</i> bound on $s(t)$ for $\alpha < 0$	35
6. Existence and uniqueness for all times in case of evaporation	38
7. Further <i>a priori</i> bounds	40
8. Continuity and analyticity of the solution with respect to α	42
9. Asymptotic behavior of solutions for $\alpha < 0$ as $t \rightarrow \infty$	54
References	66

Introduction. We shall refer to [2] as Part I. In Part I we proved the existence and uniqueness of the solution of Stefan problems for all future time. In this Part II we shall discuss problems of condensation and evaporation of one liquid drop surrounded by vapor of its own substance. We proceed to describe the main results.

If the initial vapor density on the surface of the drop is equal to the saturation density, then in case of condensation ($\alpha < 0$) existence and uniqueness are asserted for all future times and in case of evaporation ($\alpha > 0$) as long as the radius $s(t)$ of the drop remains positive. Here α is a certain physical quantity which in case $\alpha < 0$ is assumed to be sufficiently small, and in case $\alpha > 0$ is assumed to be < 1 . If the initial vapor density on the surface of the drop is not

Prepared under ONR Contract Nonr-222(37) (NR 041 157) with the University of California in Berkeley.