

ABSTRACT OF A THESIS

THEORETICAL STUDY OF HYDRATION KINETICS OF INDIVIDUAL PHASE COMPONENTS OF PORTLAND CEMENT

Vikranth Dalavaipalle

Master of Science in Chemical Engineering

Recent experimental studies using X-ray diffraction are providing the most detailed description of Portland cement and slag blended cement hydration to date. This data may provide the basis for distributed parameter kinetic modeling. Traditional kinetic modeling approaches apply a single temperature dependent kinetic parameter (single activation energy) to the lumped hydration process. While this has proven rather successful at predicting lumped property development such as non-evaporable water and strength development, this approach is unable to describe the distributed evolution of individual phases. A distributed parameter modeling approach has been explored using recent literature data which describes both the time and temperature effects on discrete phase evolution. Proven kinetic models such as the Avrami and Knudsen equation were applied to individual cement phases and to the blended slag phase in an attempt to develop a distributed parameter kinetic model.

**THEORETICAL STUDY OF HYDRATION KINETICS OF INDIVIDUAL
PHASE COMPONENTS OF PORTLAND CEMENT**

A Thesis

Presented to

The Faculty of the Graduate School
Tennessee Technological University

by

Vikranth Dalavaipalle

In Partial Fulfillment

Of the Requirements for the Degree

MASTER OF SCIENCE

Chemical Engineering

May 2004

CERTIFICATE OF APPROVAL OF THESIS

THEORETICAL STUDY OF HYDRATION KINETICS OF INDIVIDUAL
PHASE COMPONENTS OF PORTLAND CEMENT

by


Vikranth Dalavaipalle

Graduate Advisory Committee:



Joseph J. Bismarck, Chairperson

01-26-2004
Date



Pedro Arce

01-26-04
Date



Sastry Munukutla

1-26-04
Date

Approved for the Faculty:

Francis Otuonye
Associate Vice President for Research and
Graduate Studies

Date