HIGHER TECHNICAL INSTITUTE

MECHANICAL ENGINEERING DEPARTMENT

DIPLOMA PROJECT

DESIGN OF A COMPUTER - CONTROLLED GAS FLOW SYSTEM

M/866

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JULY 1999

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Project Report

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Abstract

Design of a Computer-controlled Gas Flow System

by Andreas Rinis

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A gas-flow system was designed to accommodate critical flow rates of various gaseous species. All experimental parameters are accounted for and pertinent calculations are presented as well. A schematic of the actual design is also provided with all the critical components of the experimental set-up.

The design can accommodate a singular or combined flow of gases by using a manifold.

The purpose of the design is to establish an environment with controlled partial pressure for the subsequent control of the chemical activity in an open flow system.

The critical control of the chemical activity enables among other applications the making of novel catalytic materials.

Introduction

The chemical activity is a critical parameter when dealing with solid state reactions and chemical thermodynamics. The control of this particular parameter can initiate nucleation and growth of a particular solid phase. The chemical activity is a function of the partial pressure of the gaseous species and the processing temperature.

The implicit purpose of this project is to enable the critical control of the chemical activity by experimental control of the gaseous flow rate. A schematic of the actual set-up is provided with all the relevant parameters and pertinent calculations.

For the purpose of exemplifying the significance of the experimental set-up an actual example will be cited with all the relevant calculations.

The second parameter required for the critical control of the chemical activity is the temperature, therefore it has to be emphasized that the computerized set-up and relevant software were selected in such a way so as to enable the control of the temperature without further experimental design.The schematic of the experimental set-up in conjunction with the information given in this work render this project as the foundation for future work in controlling the nucleation and growth of novel solid state phases.