[©] BASIC CONCEPTS IN PHASE EQUILIBRIA

Duke Omondi Orata

01170

UNIVERSITY OF NAIROBI LIBRARY P. O. Box 30197 NAIROBI



Nairobi University Press

Contents

Preface • vii •

Chapter

Stability of Phases • 1 •

What makes a phase stable Principle of uniform chemical potential Effect of temperature on chemical potential Effect of pressure on chemical potential-temperature curves.

2: The Clapeyron Equation • 13 •

Phase and components Use of Clapeyron equation in the construction of phase boundaries

3: Pressure-Temperature Diagrams for Real Systems • 27 •

Phase diagram for water Phase diagram for carbon dioxide Phase diagram for sulphur Phase diagram for helium

The Lever Principle and the Phase Rule • 37 •

The lever principle The phase rule Derivation of the phase rule for a multicomponent system

5: Applications of Phase and Lever Principles • 47 •

Liquid-liquid equilibria Distillation of liquids Analysis of simple eutectic diagrams A eutectic diagram for a real system

6: Thermal Analysis •61 •

Bismuth-Cadmium system Compound formation Zinc-Magnesium system Incongruent melting compounds Alloy systems Partially miscible systems in the solid state Systems with transition points

7: A Brief Survey of Three Component Systems • 76 •

Gibbs-Roozeboom triangular diagrams Acetic acid-water-chloroform system Triangular diagram for two partially miscible pairs

Reference Texts • 83 •

Index • 85 •

Preface

This textbook deals with the thermodynamic concepts as applied to phase equilibria. The book is ideal for both specialist and general degree students in chemistry and pharmacy.

Elaborate illustrations and complete mathematical details have been given to help the student grasp the fundamental ideas and concepts in phase equilibria. This approach has resulted primarily from my acummulated experience, gathered during my teaching this course to various undergraduate classes.

The student is strongly advised to attempt the problems given at the end of each chapter- the best way of learning physical chemistry is by solving as many problems as possible.

> Duke Omondi Orata May 1994