.

~

CONTENTS

PREFACE	PAGE i — iii
SYNOPSIS	iv - x
LIST OF TABLES	xv - xxi
LIST OF FIGURES	xxi -xxiii

SECTION I

SECTION I	
INTRODUCTION	1 - 44
A) Potassium resources and requirements in India	1 - 6
B) Composition and relation of major constituents in sea water	6 - 8
C) Progress of evaporation of sea water	8 - 20
D) Salt producing centres and composition of brines	22 - 32
E) Processes for potassium chloride recoveries from sea water and bitterns - a review	32 - 44
SECTION II	
CHAPTER 1	``
MANUFACTURE OF MIXED SALT BY SOLAR EVAPORATION OF BITTERNS	45 -119
1) Chemistry of the process	45 - 53
2) Laboratory studies	53 - 85
A) Studies on direct evaporation of bitterns	54 - 56
B) Studies on evaporation of mixed bitterns obtained by mixing of 30 & 36° Be' bitterns	56 - 63
C) Studies on improvement in quality of mixed salt	63 - 74
D) Studies in acceleration of evaporation	74 - 85
3) Field scale studies	86 - 97
A) Yield and quality of mixed salt produced on field scale trials	86 - 90
B) Studies in storage of mixed salt	90 - 92

. . ť

xii	PAGE
C) Studies in storage of bitterns	92 - 94
D) Lay out of mixed salt pans	94 - 96
E) ^P reparation of mixed salt crystallisers	96 - 97
4) ^P rocess of mixed salt production	98 - 100
A) System of irrigation	100 - 101
B) Quality control of mixed salt	101 - 105
C) Operational difficulties in mixed salt production	105 - 1 08
D) Meteorological conditions	108 - 113
E) Storage of mixed salt	113 - 117
5) Sost estimate (summary)	118 - 119
CHAPTER 2	
UTILISATION OF MIXED SALT FOR THE RECOVERY OF POTASSIUM CHLORIDE AND BY-PRODUCTS, EPSOM SALT AND SODIUM SULPHATE	120 - 2 02
1) Chemistry of the process	120 - 134
2) Description of the process	135 - 138
3)A) Extraction of potassium chloride as carnallite, decomposition of carnallite and purification of impure potassium chloride to obtain fertiliser grade potassium chloride	· ·
and collection of sel's mixts cake	139 - 164
i) Laboratory experiments	139 - 153
ii) Pilot plant experiments	153- 164
B) Treatment of sel's mixts to obtain epsom salt and sodium sulphate as byproducts	165 - 184
i) Laboratory experiments	165 - 175
ii) Pilot plant experiments	176 - 184
C) Yield and Quality	185 - 193
4) Cost estimates	194 - 195
5) Discussion	195 - 202

xii**i**

PAGE

CHAPTER 3

, **-**

UTILISATION OF MIXED SALT AND BITTERNS FOR THE MANU- FACTURE OF POTASH ALUM	202 - 256
1) Review of the previous work	202-208
2) Description of the process	208-210
3) Basic chemistry of the process	211-212
4) Laboratory studies	212-230
5) Pilot plant studies	231-247
6) Cost estimate (summary)	248 - 251
7) Discussion	2 52-256
CHAPTER 4	
CORROSION STUDIES TO SELECT SUITABLE MATERIAL OF CONSTRUCTION	257-271
A) Corrosion studies to select material of construction for hot extraction of mixed salt to recover potassium chloride by-products	257-267
B) Corrosion studies to select material of construction for the manufacture of potash alum from mixed salt	267-271
CHAPTER 5	
PRECIPITATION OF POTASSIUM AS POTASSIUM DIPICRYL- AMINATE FROM SEA WATER AND BITTERNS AND RECOVERY	050 700
OF POTASSIUM AS NITRATE OR SULPHATE	272-320
1) Review of previous work	272-288
A) Problem of selective precipitation	272-275
B) Extraction of potassium from sea water	275-278
C) ^P reparation of dipicrylamine	278-282
D) Explosive and harmful nature of dipicrylamine	282-283
E) Chemistry of dipicrylamine	283–286
F) Dipicrylamine as reagent for potassium estimation	286-288

XIV	PAGE
2) Description of the process	289-291
3) Experimental studies	291-313
A) Laboratory experimental data	2 91- 309
B) Bench scale experimental data	3 09-311
4) Cost estimates	312
5) Discussion	312-320
· · · ·	
REFERENCES	320-325

.

.

.

.

`

xiv