

CONTENTS

	Page
Preface -----	ii
Summary -----	v
Introduction -----	1
List of symbols -----	3
Observed strength variations of sea ice -----	6
Observed phenomena -----	6
Testing procedures -----	8
Tensile strength tests -----	8
Salinity tests -----	10
Theoretical analysis -----	11
Some comments on stress concentration -----	11
Precipitation of salts -----	12
Effect of brine inclusions on the strength of sea ice -----	12
General theory -----	12
Specific models -----	18
Elliptical cylinders -----	18
Brine content -----	21
Chemical Analysis -----	22
Freezing point of brine -----	22
Some basic assumptions for "standard sea ice" -----	24
Methods for computing phase relations -----	25
Relative concentration of the main ions in brine as a function of temperature -----	25
Phase relations in "standard sea ice" -----	30
Relative volume of brine -----	32
Evaluation of ring tests results -----	33
Empirical analysis -----	37
Theoretical analysis of test results -----	37
Theory of reinforcement by salts -----	43
Conclusion -----	48
References -----	48
Appendix A: Relative volume of brine in standard sea ice -----	A1
Appendix B: Gravimetric constants for the main constituents in the brine-salt system of sea ice -----	B1

ILLUSTRATIONS

Figure	Page
1. Observed vs computed strength of sea ice -----	7
2. Strength conditions of sea ice, depending on temperature and salinity -----	7
3. Relative tensile strength of sea ice as a function of temperature and salinity -----	13
4. Laminar structure of a sea-ice crystal -----	14
5. Cylindrical shape of brine inclusions -----	14
6. Freezing point of brine as a function of the ratio of dissolved salts to pure water -----	24
7. Relative loss of Ca^+ due to the precipitation of $\text{CaCO}_3 \cdot 6\text{H}_2\text{O}$ -----	26
8. Relative concentration of the principle ions in brine as a function of temprature -----	28
9. Relative amount of ions and salts in standard sea ice -----	30
10. Phase diagram for sea ice -----	32
11. Relative volume of brine in standard sea ice -----	33
12. Nomogram for relative brine volume in sea ice -----	33
13. Stresses at characteristic points in a "ring" under compression -----	35