

# Thermodynamics properties of LiBr-H<sub>2</sub>O-1, 4-dioxane Solution

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## Abstract

Duhling charts are important for the design of absorption refrigeration-heat pump systems. The objective of the present study is to develop a Duhling chart of LiBr-H<sub>2</sub>O-1, 4-dioxane solutions at a mixing mole fraction of 0.95 (H<sub>2</sub>O=1). It was identified that the solubility is improved when 1, 4-dioxane is added to high-density LiBr aqueous solutions<sup>1)</sup>. A 1, 4-dioxane dosage greater than 0.95 is appropriate in mole fractions for all quantities of water in saturated solutions. Based on these results, the boiling point of LiBr-H<sub>2</sub>O-1, 4-dioxane solution was measured, and a Duhling chart produced. The results show that the addition of 1, 4-dioxane decreases the boiling point of LiBr-H<sub>2</sub>O-1, 4-dioxane solutions and increases the Latent heat at an identical concentration.

**Key words** : Duhling chart, LiBr, 1, 4-dioxane, Boiling point, Absorption heat pump

## 1 Introduction

Accurate vapor pressure data for aqueous LiBr solutions are necessary for the development and extension of the performance range of absorption air conditioning machines. Vapor pressure-temperature-concentration diagrams for the LiBr-H<sub>2</sub>O system have been presented by other authors<sup>2)-9)</sup>. However, these P-T-X diagrams were constructed by extrapolating small sets of data determined over narrow temperature ranges. Therefore, prior to the measurement of the boiling point of LiBr-H<sub>2</sub>O-1, 4-dioxane solutions, the vapor pressures of LiBr-H<sub>2</sub>O were measured at temperatures ranging from 293.4 K to 461.5 K and at concentrations ranging from 50 to 70 wt% in order to develop a more reliable P-T-X chart. Vapor pressure data were compared with previously published values to verify the accuracy of the chart.

The authors showed that water and 1, 4-dioxane mix independently in a 1, 4-dioxane aqueous solution, that water (the primary component) changes its liquid structure according to the mixing mole fraction<sup>10)</sup>, and that the solubility was improved when 1, 4-dioxane was added to a high-density LiBr aqueous solution. An appropriate dosage of 1, 4-dioxane in saturated

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