



Thermophysical properties of seawater: A review of existing correlations and data

Mostafa H. Sharqawy^a, John H. Lienhard V^{a*}, Syed M. Zubair^b

^a*Department of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, MA 02139-4307, USA*

Tel. +1 (617) 253-3790; email:lienhard@mit.edu

^b*Department of Mechanical Engineering, King Fahd University of Petroleum and Minerals, Dhahran 31261, Saudi Arabia*

Received 14 November 2009; Accepted 2 December 2009

ABSTRACT

Correlations and data for the thermophysical properties of seawater are reviewed. Properties examined include density, specific heat capacity, thermal conductivity, dynamic viscosity, surface tension, vapor pressure, boiling point elevation, latent heat of vaporization, specific enthalpy, specific entropy and osmotic coefficient. These properties include those needed for design of thermal and membrane desalination processes. Results are presented in terms of regression equations as functions of temperature and salinity. The available correlations for each property are summarized with their range of validity and accuracy. Best-fitted new correlations are obtained from available data for density, dynamic viscosity, surface tension, boiling point elevation, specific enthalpy, specific entropy and osmotic coefficient after appropriate conversion of temperature and salinity scales to the most recent standards. In addition, a model for latent heat of vaporization is suggested. Comparisons are carried out among these correlations, and recommendations are provided for each property, particularly over the ranges of temperature and salinity common in thermal and/or reverse osmosis seawater desalination applications.

Keywords: Seawater; Thermophysical properties; Density; Specific heat; Thermal conductivity; Viscosity; Surface tension; Vapor pressure; Boiling point elevation; Latent heat; Enthalpy; Entropy; Osmotic coefficient

* Corresponding author.