

Investigation of the (p,ρ,T) Properties of Seawater with Various Salinities

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Seawater is a solution of salts of nearly constant composition, dissolved in variable amounts of water. For scientific investigations and process design of many natural and technical processes, which have to do with seawater, it is of great importance to have a good base of thermodynamic data. In 2006, as a successor of the Joint Panel on Oceanographic Tables and Standards (JPOTS), the Working Group 127 has been established by the International Association for the Physical Sciences of the Ocean (IAPSO) and the Scientific Committee on Oceanic Research (SCOR). Its main objective is a recent evaluation of the current standards for seawater thermodynamics and, if necessary, the recommendation of improved formulations. Among the reasons for this revision process is the need for consistency between seawater properties and the more accurate recent international standards for temperature (ITS-90) and for properties of pure water (IAPWS-95). The description equation of seawater equilibrium properties, which is currently in use as the international standard for oceanography, is the 1980 International Equation of State of Seawater (EOS-80), released by JPOTS, published by UNESCO. According to the analysis of thermodynamic properties of seawater, it has to be pointed out, that, after the evaluation of EOS-80, there were no new experimental (p,ρ,T) measurements available and no other EOS has been developed for the calculation of the thermodynamic properties of seawater. The main purpose of our work is the construction of a comprehensive and accurate thermodynamic equation of state of seawater with various salinities. After the evaluation of available literature results, the (p,ρ,T) measurements of sea water at $T=(273.15 \text{ to } 473.15) \text{ K}$, $p=(0.101 \text{ to } 140) \text{ MPa}$ and salinities till $S=43$ are carried out using a high pressure – high temperature vibrating tube densimeter DMA HPM (Anton-Paar, Austria). An IAPSO Standard seawater sample ($S=34.994$) was used during the experiments. The experimental (p,ρ,T) values of seawater were described using an equation of state.

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