Contribution ID: **440** Type: **ORAL**

Density of sodium along the Liquid-Vapor Coexistence Curve, including the Critical Point

Monday, June 26, 2017 4:10 PM (20 minutes)

Sodium densities along the whole liquid-vapor coexistence curve are reanalyzed using the equation proposed by Apfelbaum and Vorob'ev(1). The formulation has built-in the correct behavior for liquid and vapor densities, both at low temperature and in the near-critical region. Thus, it satisfactorily represents the available experimental data in the low and intermediate temperature range, while providing a sound density extrapolation to the critical point: in reduced units, the calculated values for sodium are consistent with those measured for Rubidium and Cesium(2), as required by the principle of Corresponding States. The enthalpy of vaporization, calculated via Clausius-Clapeyron relation, is also correctly described.

The main differences between our results and those from the previous formulation by Finck and Leibowitz(3) are found in the high-temperature region (2300 K –Tc), where the coexistence curve predicted by the latter exhibits an unusual shape.

Our results indicate that the value for the critical density, (180 ± 10) kg/m3, is 20 % lower than the one recommended before (219 ± 20) kg/m3.

(1) E. M. Apfelbaum and V. S. Vorob'ev, The Wide-Range Method to Construct the Entire Coexistence Liquid–Gas Curve and to Determine the Critical Parameters of Metals, J. Phys. Chem. B, 2015, 119, 11825–11832.

(2) S. Jüngst, B. Knuth and F. Hensel, Observation of Singular Diameters in the Coexistence Curves of Metals, Phys. Rev. Lett. 1985, 55, 2160-2163.

(3) J. K. Fink and L. Leibowitz, Thermodynamic and Transport Properties of Sodium Liquid and Vapor, ANL/RE-95/2 (1995).

Country/Int. Organization

Argentina - Comision Nacional de Energia Atomica (CNEA)

Primary author: Mr VAZQUEZ, Emanuel (CNEA - Argentina)

Co-authors: Prof. ALVAREZ, Jorge (CNEA - Argentina); Dr JAPAS, M. Laura (CNEA - Argentina)

Presenter: Dr JAPAS, M. Laura (CNEA - Argentina)

Session Classification: 6.2 Thermal Hydraulics Calculations and Experiments

Track Classification: Track 6. Test Reactors, Experiments and Modeling and Simulations