EXTRAPOLATION OF IAPWS-IF97 DATA: 
THE SATURATION PRESSURE OF H₂O IN THE 
CRITICAL REGION

Ustyuzhanin E.E.,* Ochkov V.F

MPEI, Moscow, Russia
*evgust@gmail.com

Some literature sources including WEB sites are analyzed in this report. The sources contain an information about thermophysical properties of H₂O including the vapor pressure \((P_s, T)\)-data in the form of an international standard table [1]. Our analyses shows that a traditional database [1, 2] represents these \((P_s, T)\)-data at \(t > 0.002\), here \(t = (T_c - T)/T_c\) is a reduced temperature. We have considered equations \(P_s(t)\) those are suggested by Wagner [1], 1973, Xiang and Tan, 1994, and Wu et al., 2005 and Abdulagatov et al., 2011. An analytical form, \(F(t, D, B)\), [3] is chosen to express \(\ln(P_s/P_c)\). \(F(t, D, B)\) has a combined structure with scaling and regular parts: \(F_{\text{scale}}(t, D, B_1)\) and \(F_{\text{reg}}(t, B_2)\), here \(D = (\alpha, P_c, T_c, ...)\) are critical characteristics, \((B_1, B_2)\) are coefficients.

Adjustable coefficients \(B = (B_1, B_2)\) and characteristics \(D\) are determined by fitting the combined model to input \((P_s, T)\)-data [1] with the help of a non linear LS method [3]. Some application results are got and discussed. They include the first and the second derivatives of \(P_s(t)\) at \(t = 0.00001–0.005\). We have tested some models \(P_s(t)\) and compared them with \(F(t, D, B)\) in the critical region. Some results mentioned are located in a WEB site http://twt.mpei.ac.ru/.