Calor de Vaporización del Agua a partir de valores experimentales.

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Introducción

El valor del calor de vaporizacion de un compuesto puro se deduce de la relación de Clausius-Clapeyron.

$$\frac{dP}{dT} = \frac{\Delta H_{vap}}{T\,\Delta V_{vap}}$$ Clapeyron

$$\frac{dP}{dT} = \frac{\Delta H_{vap}}{T\left(V_v - V_l\right)} = \frac{\Delta H_{vap}}{T\left(\frac{Z_v RT}{P} - \frac{Z_l RT}{P}\right)} = \frac{\Delta H_{vap}}{\frac{RT^2}{P}\left(Z_v - Z_l\right)}$$

$$\frac{dP}{dT} = \frac{P\Delta H_{vap}}{RT^2\left(Z_v - Z_l\right)}$$

$$\frac{d\ln(P)}{dT} = \frac{\Delta H_{vap}}{RT^2}$$

Ecuación de Clausius – Clapeyron.

Introducción

$$\frac{d\ln(P)}{dT} = \frac{\Delta H_{vap}}{RT^2} \Rightarrow \frac{d\ln(P)}{dT} T^2 = \frac{\Delta H_{vap}}{R} \Rightarrow \frac{d\ln(P)}{\frac{1}{T^2}\,dT} = \frac{\Delta H_{vap}}{R}$$

$$\Rightarrow \frac{d\ln(P)}{-d\,\frac{1}{T}} = \frac{\Delta H_{vap}}{R}$$

$$\frac{d\ln(P)}{d\,\frac{1}{T}} = -\frac{\Delta H_{vap}}{R}$$

Introducción

$$\frac{d\ln\left(P\right)}{d\,\dfrac{1}{T}} = -\frac{\Delta H_{vap}}{R}$$

R_{H2O} = 0.461526 kJ/(kg K)

T [K]	P [bar]
298.1437	0.031686
313.1398	0.073813
323.1371	0.123446
333.1344	0.19933
343.1318	0.31177
353.1292	0.473752
373.1244	1.01325

STIMSON (1969)

Solución

T [K]	P [bar]	ln(P)	(1/T)	dln(P)/d(1/T)	ΔH [kJ/kg]
298.1437	0.031686	-3.45188034	0.00335409	-5264.79335	2429.83901
313.1398	0.073813	-2.60622041	0.00319346	-5242.07601	2419.35437
323.1371	0.123446	-2.09195147	0.00309466	-5182.99673	2392.08775
333.1344	0.19933	-1.61279354	0.00300179	-5137.6022	2371.13699
343.1318	0.31177	-1.16548954	0.00291433	-5093.48016	2350.77353
353.1292	0.473752	-0.7470713	0.00283182	-5031.37046	2322.10828
373.1244	1.01325	0.01316299	0.00268007	-5009.66841	2312.09222

Solución

ΔH [kJ/kg]	ΔH [kJ/kg] (IPWS)	Error %
2429.83901	2441.721	0.49%
2419.35437	2406.026	0.55%
2392.08775	2382.005	0.42%
2371.13699	2357.729	0.57%
2350.77353	2333.126	0.76%
2322.10828	2308.118	0.61%
2312.09222	2256.54	2.46%