Rohsenow's Nucleate (or Pool) Boiling Correlation

$$\frac{C_{p,l}\Delta T_{sat}}{h_{fg}Pr_l^s} = C_{sf}\left[\frac{q/A}{\mu_l h_{fg}\sqrt{\frac{\sigma}{g(\rho_l-\rho_v)}}}\right]^{0.33}$$

where $C_{p,l}$ = specific heat capacity of saturated liquid (J/kg°C)

ΔT_{sat} = Wall superheat = Tw – T_{sat} (°C)

h_{fg} = enthalpy of vaporization, Btu/lb_m or J/kg
Pr_l = Prandtl number of saturated liquid
q/A = heat flux per unit area, Btu/h · ft^2 or W/m^2 · °C
μ_l = liquid viscosity, lb_m/h · ft, or kg/m·s
σ = surface tension of liquid-vapor interface, lb_f/ft or N/m - See Table 9-1
g = gravitational acceleration, ft/s^2 or m/s^2 = 9.81 m/s^2
ρ_l = density of saturated liquid, lb_m/ft^3 or kg/m^3
ρ_v = density of saturated vapor, lb_m/ft^3 or kg/m^3
C_{sf} = constant, determined from experimental data – See Table 9-2
s = 1.0 for water and 1.7 for other liquids

Table 9-1 Vapor-liquid Surface Tension for Water.

Saturation temperature		*Surface tension*	
°F	°C	$\sigma \times 10^4$, lb_f/ft	σ, N/m
32	0	51.8	75.6×10^{-3}
60	15.56	50.2	73.3
100	37.78	47.8	69.8
140	60	45.2	66.0
200	93.33	41.2	60.1
212	100	40.3	58.8
320	160	31.6	46.1
440	226.67	21.9	32.0
560	293.33	11.1	16.2
680	360	1.0	1.46
705.4	374.1	0	0

Table 9-2 Values of the Coefficient C_{sf} for Various Liquid-surface Combinations.

Fluid-heating-surface combination	C_{sf}
Water-copper [11]†	0.013
Water-platinum [12]	0.013
Water-brass [13]	0.0060
Water–emery-polished copper [29]	0.0128
Water–ground and polished stainless steel [29]	0.0080
Water–chemically etched stainless steel [29]	0.0133
Water–mechanically polished stainless steel [29]	0.0132
Water–emery-polished and paraffin-treated copper [29]	0.0147
Water–scored copper [29]	0.0068
Water–Teflon pitted stainless steel [29]	0.0058
Carbon tetrachloride-copper [11]	0.013
Carbon tetrachloride–emery-polished copper [29]	0.0070
Benzene-chromium [14]	0.010
n-Butyl alcohol–copper [11]	0.00305
Ethyl alcohol–chromium [14]	0.027
Isopropyl alcohol–copper [11]	0.00225
n-Pentane–chromium [14]	0.015
n-Pentane–emery-polished copper [29]	0.0154
n-Pentane–emery-polished nickel [29]	0.0127
n-Pentane–lapped copper [29]	0.0049
n-Pentane–emery-rubbed copper [29]	
35% K_2CO_3–copper [11]	
50% K_2CO_3–copper [11]	

†Numbers in brackets refer to source of data.