South Dakota School of Mines and Technology
Department of Materials and Metallurgical Engineering

MET 321 Standard State Homework Homework #11.1

A member of your design team has proposed to use brass (70/30 Cu/Zn) as the material for a filament holder in a TEM under high vacuum. You are questioning the material choice since the brass contains Zn, which has fairly high vapor pressure. Compute the maximum temperature the filament holder can reach before the vapor pressure of the Zn in the brass exceeds the ambient TEM pressure of $2x10^{-7}$ Torr?

Your associate thinks the following data might from Hultgren, et al be useful.

T, K	P_{Zn}, atm
298.15	$2.40x10^{-17}$
400	$1.54x10^{-11}$
500	$3.75x10^{-8}$
600	$6.60x10^{-6}$
692.655	$2.06x10^{-4}$
700	$2.56x10^{-4}$
800	$3.37x10^{-3}$

Partial Molar Quantities for Solid Cu-Zn Alloys at 773 K

x_{Zn}	Phase	a_{Zn}	γ_{Zn}	H^M_{Zn}, cal/gfw
0.0	(Cu)	0.000	0.014	-5500
0.1	(Cu)	0.002	0.024	-6853
0.2	(Cu)	0.010	0.050	-5888
0.3	(Cu)	0.032	0.108	-4149
0.381	(Cu)	0.068	0.179	-3199
0.44	Beta	0.068	0.155	-3731
0.45	Beta	0.075	0.166	-3731