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

MET 426/526 Sparging for H Removal in Cu

$2H = H_2$ $$K = \frac{PH_2}{(wt\%\underline{H})^2}$$

$1/2\ H_{2(g)} = \underline{H}$ $\Delta G° = 43,514 + 31.38T$ J/gmole

$\Delta G°$ = 86,598.7 J /gmole at 1356 K

K = 3.86 * 10^6 Wt% H_i = 5.09 * 10^{-4}

This is minimum in the melt at T_f (9.72 * 10^{-4}%). There is essentially no solubility at room temperature.

$$d(N_{H_2}) = -\frac{Md(wt\%\underline{H})}{2*100\%}$$

$$N_{H_2} = \frac{P_{H_2}}{1-P_{H_2}}\frac{P_T V_{Ar}}{RT}$$

$$d(N_{H_2}) = -\left(\frac{P_{H2}}{1-P_{H2}}\right)\frac{P_T}{RT}dV_{Ar} = -\frac{Md(wt\%H)}{200}$$

$$\int dV_{A1} = \frac{RTM}{P_T 200}\int\left[1-\frac{1}{P_{H2}}\right]d(wt\%H) \qquad P_{H2} = K(wt\%H)^2$$

$$V_{A1} = \frac{RTM}{P_T 200}\left[(wt\%H_f - wt\%H_i) + \frac{1}{K}\left(\frac{1}{wt\%H_f} - \frac{1}{wt\%H_\iota}\right)\right]$$

M=1000Kg = 1 MT

V_{Ar} = 16.3 £t^3 STP/MT 90.0% Removal

V_{Ar} = 197.4 £t^3 STP/MT 99.0% Removal

V_{Ar} = 2010 £t^3 STP/MT 99.9% Removal