APPENDIX

The mole fraction of H_2O in the fluid(s) is calculated with the equation:

$$X_{H_2O}^{fluids} = \frac{\frac{mass_{H_2O}^{fluids}}{18}}{\frac{mass_{H_2O}^{fluids}}{18} + \frac{mass_{Cl}^{fluids}}{35.453} + \frac{mass_{NaK}^{fluids}}{31}} \qquad \text{(I)}$$

and the mole fraction of Cl in the fluid(s) is calculated with the equation:

$$X_{Cl}^{fluid} = \frac{\frac{mass_{Cl}^{fluids}}{35.453}}{\frac{mass_{H2O}^{fluids}}{18} + \frac{mass_{Cl}^{fluids}}{35.453} + \frac{mass_{NaK}^{fluids}}{31}} \qquad \text{(II)}$$

recalling that the mass of 31 accounts for the moles of Cl that are chemically associated with an assumed equimolar quantity of Na and K (i.e., their averaged mass). Similarly, the X_{H2O}^{melt} and X_{Cl}^{melt} are calculated, respectively, with the equations:

$$X_{H_2O}^{melt} = \frac{\frac{mass_{H_2O}^{melt}}{18}}{\frac{mass_{H_2O}^{melt}}{18} + \frac{mass_{Cl}^{melt}}{35.453} + \frac{mass_{volatile-freemelt}^{melt}}{265}} \qquad \text{(III)}$$

and:

$$X_{Cl}^{melt} = \frac{\frac{mass_{Cl}^{melt}}{35.453}}{\frac{mass_{Cl}^{melt}}{35.453} + \frac{mass_{H_2O}^{melt}}{18} + \frac{mass_{volatile-freemelt}^{melt}}{265}} \qquad \text{(IV)}$$

Rearranging allows one to calculate the wt% H_2O in the melt with equation (V):

$$wt\%\ \mathrm{H_2O\ in\ melt} = \frac{18 * \mathrm{X_{H_2O}^{melt}} * \left[\left(\frac{wt\%\ \mathrm{Cl\ in\ melt}}{35.45}\right) + \left(\frac{(100 - inputwt\%\ \mathrm{H_2O\ in\ melt} - wt\%\ \mathrm{Cl\ in\ melt})}{265}\right)\right]}{1 - \mathrm{X_{H_2O}^{melt}}} \qquad \text{(V)}$$

This approach, however, requires the input of an initial estimate of the mass of H_2O in the melt (i.e., to estimate the *inputwt% H_2O in melt*) in order to solve equations (IV) and (V). It requires that this mass of H_2O in the melt be modified, iteratively, until its estimated equivalent concentration, i.e., ([mass of H_2O in melt/mass of melt]*100) ratio corresponds to the final H_2O concentration determined using the equation (V).