

### Formulae used for calculations in Table S2

<sup>a</sup> The S concentrations in melts calculated using the equation from Peng et al [29]:

$$\ln K_d = 21130/T(K) - 16.2$$

, where T is substituted by the AST;

<sup>b</sup> The S concentrations in melts calculated using the equation from Parat et al [28]:

$$SO_3\text{apatite} = 0.157 \cdot \ln(SO_3\text{melt}) + 0.9834, R^2 = 0.68$$

<sup>c</sup>  $\log f_{O_2}$  calculated using the equation from Miles et al [56]:

$$\log f_{O_2} = -0.0022(\pm 0.0003)Mn(ppm) - 9.75(\pm 0.46)$$

<sup>d</sup>  $\Delta FMQ$  calculated by combining the formula from Myers and Eugster [57] for

$$\log f_{O_2}(FMQ): \log f_{O_2}(FMQ) = -24441.9/T(K) + 8.290(\pm 0.167)$$