

## Supplementary Figure 1:

Variations of ratios of  $\text{Fe}^{2+}/(\text{Fe}^{2+}+\text{Mg}^{2+})$  versus (a)  $\text{Fe}^{3+}/(\text{Fe}^{3+}+\text{Al}^{3+}+\text{Mn}^{3+})$  and (b) Y+HREE for zoned allanite-(Ce). This figure differs from Figure 9 by assuming all manganese is  $\text{Mn}^{3+}$ .

