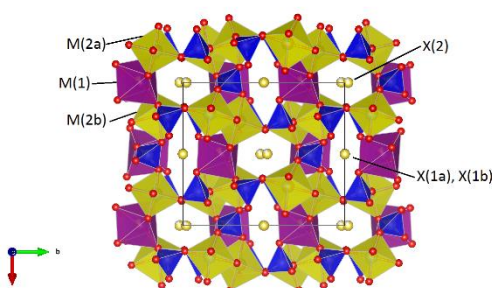


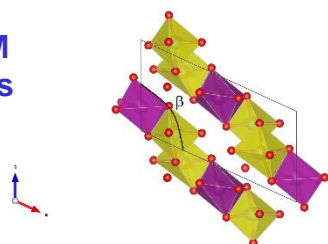
## The wyllieite group

- **Phosphate** minerals occurring in granitic pegmatites.
- **Structural formula:**  
 $X(1a)_2X(1b)_2X(2)_4M(1)_4M(2a)_4M(2b)_4(PO_4)_{12}$
- **Space group**  $P2_1/n$ ,  $a = 11.83\text{-}12.00$ ,  $b = 12.35\text{-}12.45$ ,  $c = 6.29\text{-}6.44$  Å,  $\beta = 114.35\text{-}114.54^\circ$ .
- **Crystal structure topologically identical** to the alluaudite structure.
- **Six end-member compositions:**  
 Wyllieite:  $Na_2MnFe^{2+}Al(PO_4)_3$   
 Ferrowyllieite:  $Na_2Fe^{2+}Fe^{2+}Al(PO_4)_3$   
 Rosemaryite:  $[NaMnFe^{3+}Al(PO_4)_3]$   
 Ferrorosemaryite:  $[NaFe^{2+}Fe^{3+}Al(PO_4)_3]$   
 Qingheite:  $Na_2MnMgAl(PO_4)_3$   
 Qingheite-( $Fe^{2+}$ ):  $Na_2Fe^{2+}MgAl(PO_4)_3$

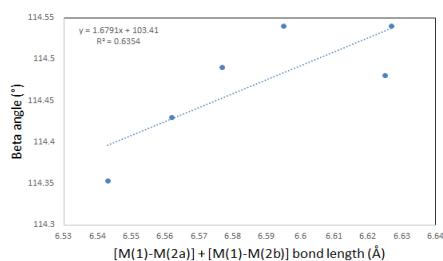
## The wyllieite structure



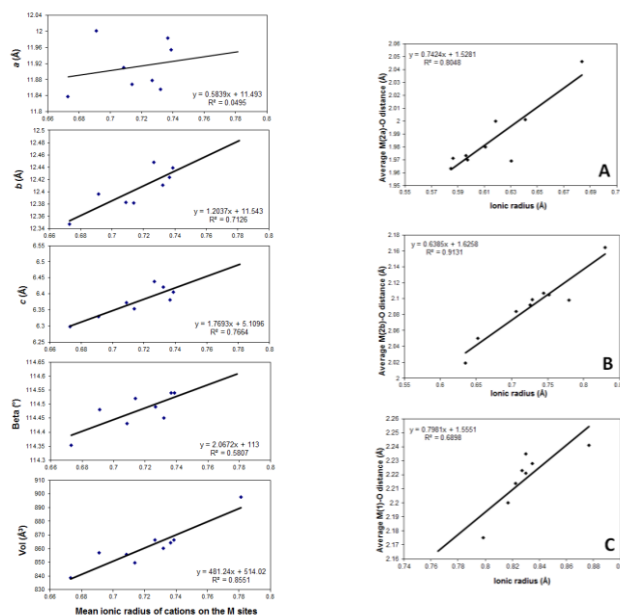
## The M chains



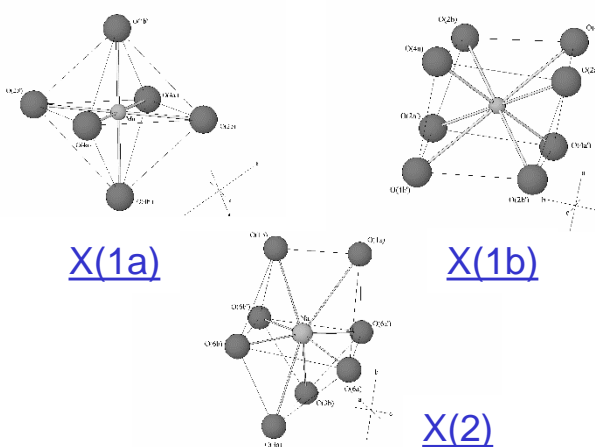
## Variations of the beta angle



## Variations of unit-cell parameters and M-O bond lengths



## Morphology of the X crystallographic sites



## Conclusions

- Structural data on all members of the wyllieite group have been collected, showing the complex crystal-chemistry of the group.
- The role of Al is significant, but more experimental data are necessary to understand the mechanisms responsible for the alluaudite-to-wyllieite transition.