



**Supplemental Figure 1x:** X-ray diffraction patterns of  $\text{LiMnPO}_4$  (a),  $\text{Li}(\text{Mn}_{0.6}\text{Fe}_{0.4})\text{PO}_4$  (b),  $\text{Li}(\text{Mn}_{0.4}\text{Fe}_{0.6})\text{PO}_4$  (c) and  $\text{LiFePO}_4$  (d) showing substitutional solid solutions on the M2 olivine site. Corresponding values for the unit cell volumes derived from indexing routines are:  $\text{LiMnPO}_4$ ,  $302.23\text{\AA}^3$ ;  $\text{Li}(\text{Fe}_{0.4}\text{Mn}_{0.6})\text{PO}_4$ ,  $297.36\text{\AA}^3$ ;  $\text{Li}(\text{Fe}_{0.6}\text{Mn}_{0.4})\text{PO}_4$ ,  $293.81\text{\AA}^3$ ;  $\text{LiFePO}_4$ ,  $291.23\text{\AA}^3$ .