

Supporting Information

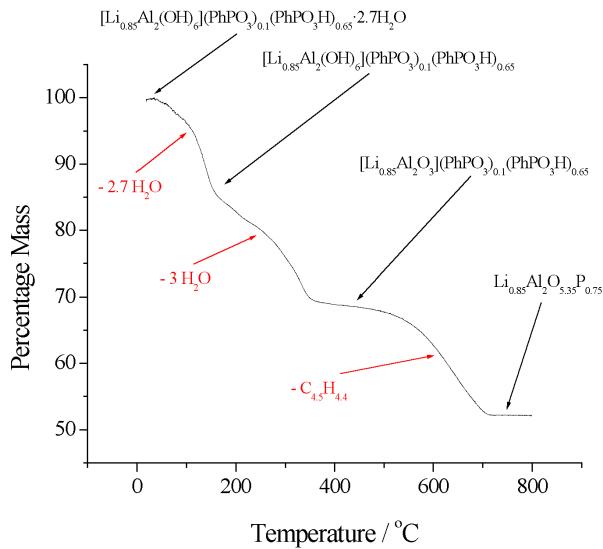
^{31}P MAS NMR data for MPA species.

Species	$\delta(^{31}\text{P})/\text{ppm}$
MePO_3H_2	37.3
MePO_3H^-	21.5
MePO_3^{2-}	16.5
$[\text{Li}_{0.84}\text{Al}_2(\text{OH})_6](\text{MePO}_3)_{0.19}(\text{MePO}_3\text{H})_{0.46}\cdot 2.6\text{H}_2\text{O}$	19.9

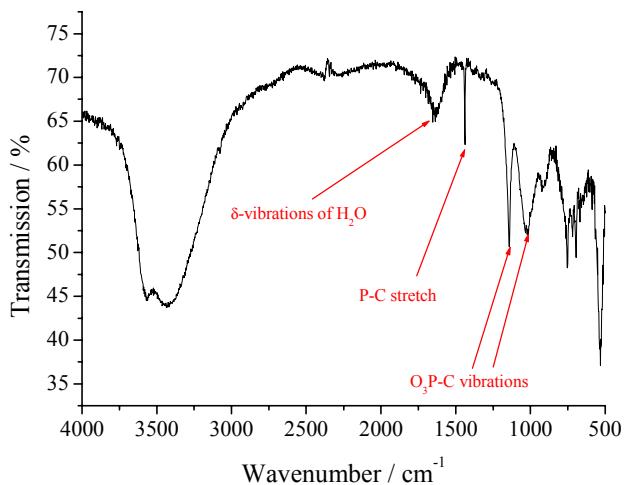
^{31}P MAS NMR data for PPA species.

Species	$\delta(^{31}\text{P})/\text{ppm}$
PhPO_3H_2	21.3 ³²
PhPO_3H^-	17.8 ³²
PhPO_3^{2-}	0.9 ³²
$[\text{Li}_{0.85}\text{Al}_2(\text{OH})_6](\text{PhPO}_3)_{0.1}(\text{PhPO}_3\text{H})_{0.65}\cdot 2.7\text{H}_2\text{O}$	15.3

Thermogravimetric analysis of $[\text{Li}_{0.85}\text{Al}_2(\text{OH})_6](\text{PhPO}_3)_{0.1}(\text{PhPO}_3\text{H})_{0.65}\cdot 2.7\text{H}_2\text{O}$



IR spectrum of $[\text{Li}_{0.85}\text{Al}_2(\text{OH})_6](\text{PhPO}_3)_{0.1}(\text{PhPO}_3\text{H})_{0.65}\cdot 2.7\text{H}_2\text{O}$



Intercalation compounds with MPA synthesised at different pH

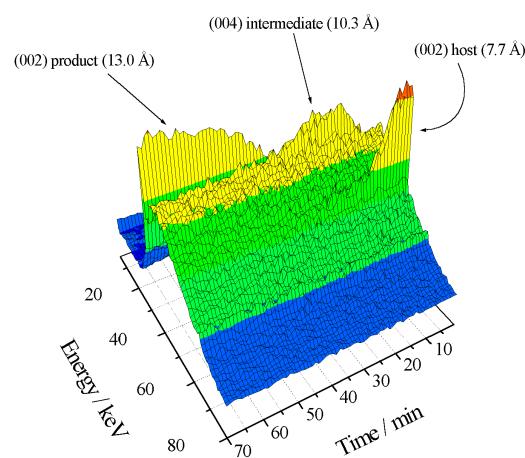
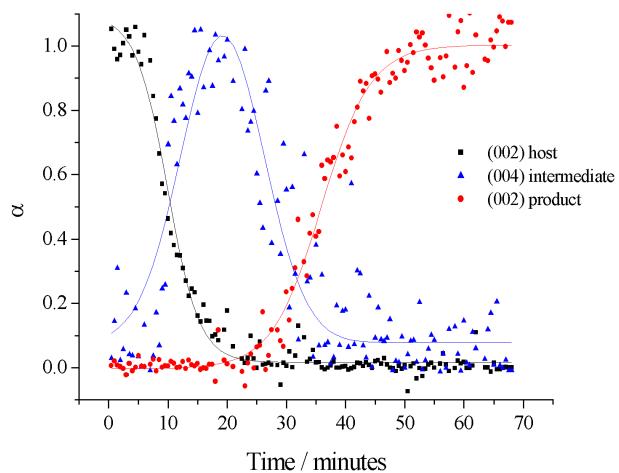
pH	Intercalation compound	$d_{002}/\text{\AA}$
4	$[\text{Li}_{0.73}\text{Al}_2(\text{OH})_6](\text{MePO}_3)_{0.14}(\text{MePO}_3\text{H})_{0.45} \cdot 2.5\text{H}_2\text{O}$	12.7
6	$[\text{Li}_{0.75}\text{Al}_2(\text{OH})_6](\text{MePO}_3)_{0.18}(\text{MePO}_3\text{H})_{0.39} \cdot 2.6\text{H}_2\text{O}$	12.7
8	$[\text{Li}_{0.84}\text{Al}_2(\text{OH})_6](\text{MePO}_3)_{0.19}(\text{MePO}_3\text{H})_{0.46} \cdot 2.6\text{H}_2\text{O}$	12.7
10	$[\text{Li}_{0.91}\text{Al}_2(\text{OH})_6](\text{MePO}_3)_{0.455} \cdot 4\text{H}_2\text{O}$	11.1

Kinetic data for the intercalation of MPA, EPA and BPA into $[\text{LiAl}_2(\text{OH})_6]\text{Cl} \cdot \text{H}_2\text{O}$.

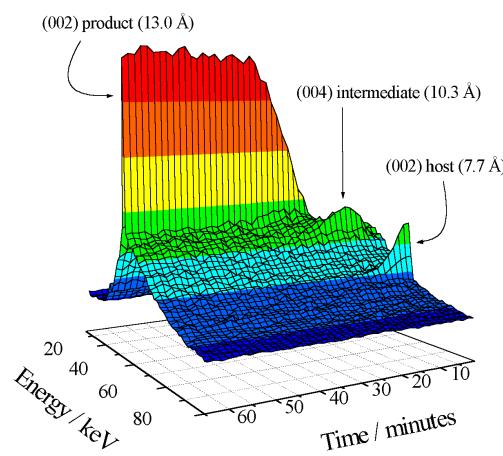
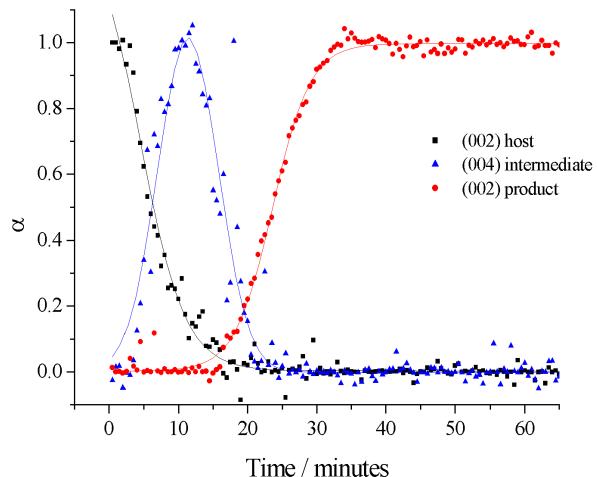
Phosphonic acid	Temperature / °C	Reaction order, m	Reaction rate, $k / 10^{-3} \text{ s}^{-1}$
MPA	3.9	0.30	2.87
	6.8	0.45	7.92
EPA	3.1	0.61	1.31
	5.9	0.65	2.85
	8.1	0.45	4.69
BPA	3.1	0.45	9.86
	5.9	0.39	21.83

Time resolved *in situ* EDXRD data showing the course of the ion exchange reaction between $\text{[LiAl}_2(\text{OH})_6\text{Cl}\cdot\text{H}_2\text{O}$ and MPA at (a) pH 4, (b) pH 6, and (c) pH 10.

(a) pH 4



(b) pH 6



(d) pH 10

