

Supporting Information for

**Comparative study of the synergistic effect of binary and ternary
LDH with intumescent flame retardant on the properties of
polypropylene composites**

Xin Wang,^a Yvonne Spörer,^b Andreas Leuteritz,^b Ines Kuehnert^b, Udo Wagenknecht^b, Gert Heinrich^b, and De-Yi Wang^{*ab}

^a IMDEA Materials Institute, C/Eric Kandel, 2, 28906 Getafe, Madrid, Spain

^b Leibniz-Institut für Polymerforschung Dresden e. V., Hohestraße 6, D-01069 Dresden, Germany

E-mail Address: deyi.wang@imdea.org

Structural characterization of binary LDH

XRD patterns of MgAl-LDH and organo-modified MgAl-LDH (b-LDH) are displayed in Fig. S1. As can be seen, MgZnAl-LDH exhibits the typical profile of LDH materials with the characteristics bands at $2\theta = 10.1^\circ$, 20.1° and 60.5° which are ascribed to the (003), (006) and (110) diffraction peaks, respectively. From these parameters, the basal spacing of MgAl-LDH is estimated to be 0.88 nm according to the Bragg equation. The basal reflection of organo-modified MgAl-LDH shifts to $2\theta = 3.2^\circ$ and the higher order reflections also shift to lower angle, indicating that SDBS anions have been intercalated into the interlayer galleries giving an increased interlayer spacing ($d = 2.76$ nm).

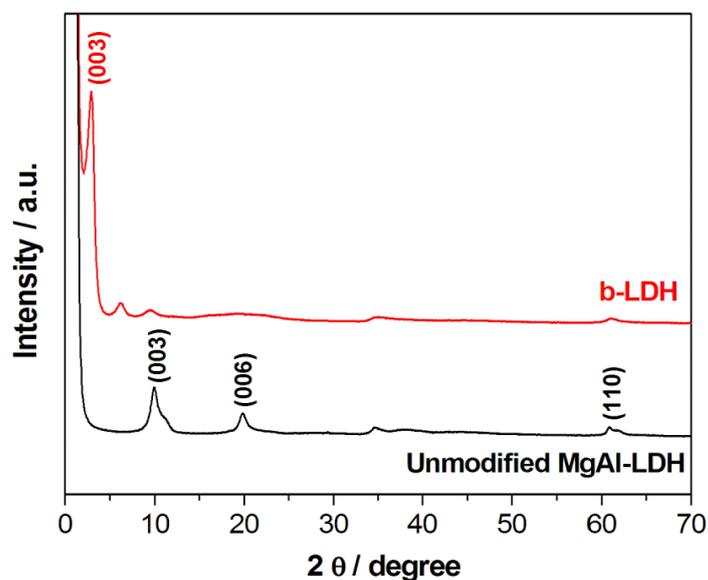


Fig. S1. Powder XRD profiles of unmodified MgAl-LDH and organo-modified MgAl-LDH.

FTIR spectra of MgAl-LDH and organo-modified MgAl-LDH are shown in Fig. S2. MgAl-LDH shows some similar absorption peaks to organo-modified MgAl-LDH: the broad peak around 3490 cm^{-1} can be ascribed to the stretching of OH groups attached to Al, Mg and Zn ions in the layers; the peak at 1626 cm^{-1} is assigned to the bending vibration of interlayer water; the strong band at 1385 cm^{-1} is attributed to the asymmetric stretching of the carbonate anion. However, compared with MgAl-LDH, some new peaks appear in the FTIR spectra of organo-modified MgAl-LDH. The appearance of the $-\text{CH}_3$ and $-\text{CH}_2-$ stretching peaks (2930 and 2860 cm^{-1}) together with the sulfonate stretching bands (1185 and 1036 cm^{-1}) confirms that SDBS have been exchanged into the interlayer space of MgAl-LDH.

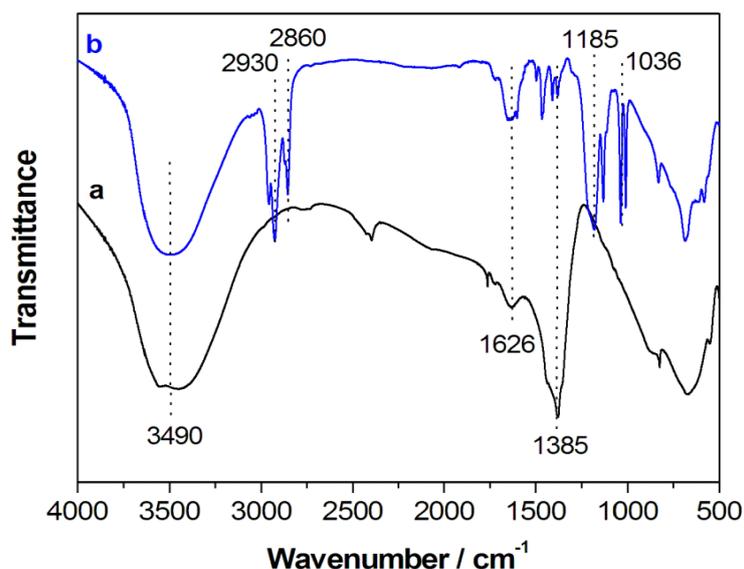


Fig. S2. FTIR spectra of (a) MgAl-LDH and (b) organo-modified MgAl-LDH.

The burned bars after LOI tests

The digital photos of the sample bars after LOI tests are displayed in Fig. S3. As can be seen, PP/IFR16/t-LDH4 can form thermally stable char that extinguished the flame immediately. However, in the case of PP/IFR16/b-LDH4, the char was not stable enough to inhibit the flame spread.



Fig. S3. Digital photos of the sample bars after LOI tests.