Supporting Information

for

Outstanding chain-extension effect and high UV resistance of polybutylene succinate containing amino-acid-modified layered double hydroxides

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Additional experimental data and experimental schemes
The procedure for calculation of experimental chemical compositions on example of LDH/HIS

The general formula of synthesized LDH with molecular weight $M_{RT}$ is:

$$[\text{Mg}_2\text{Al(OH)}_6]^{\text{A}^-_{(1-x)}}\text{NO}_3^-_x \cdot n\text{H}_2\text{O}.$$ 

XRD analysis excludes the presence of carbonates but confirms nitrate anions in interlayers space.

Data:

- Anion HIS$^-$ $M_w = 154.15$ g·mol$^{-1}$
- Anion NO$_3^-$ $M_w = 62.00$ g·mol$^{-1}$
- Mg$_2$AlOH$_6$ $M_w = 177.64$ g·mol$^{-1}$
- Mg$_2$AlO$_{7/2}$ $M_w = 131.58$ g·mol$^{-1}$

Mass of the residue at 800 °C (Mg$_2$AlO$_{7/2}$) = 55 wt %

The calculation is based on TGA traces.

$$M_{RT}(\text{LDH/HIS}) = 131.58/(1–0.55) = 292.4 \text{ g mol}^{-1}$$

The water molecule content “n” is calculated from the mass loss after the first relative minimum on the derivative curve ≈ 170°C. In the case of LDH/HIS The mass loss of H$_2$O is 7 wt %.

Mass H$_2$O = $M_{RT} \cdot \%\text{H}_2\text{O} = 292.4 \cdot 0.07 = 20.47$ g → n H$_2$O = 20.47/18.02 = 1.14 mol
Next, the amount of HIS and nitrate anions are calculated:

\[
154.15 \cdot (1-x) + 62 \cdot x = 292.4 - 177.64 - 1.14 \cdot 18.02 \quad \Rightarrow \quad x = 0.65
\]

The chemical composition for LDH/HIS is \([\text{Mg}_2\text{Al(OH)}_6](\text{HIS}^-)_{0.35}(\text{NO}_3^-)_{0.65} 1.14\text{H}_2\text{O}\).

Similar calculations have been done for LDH/PHE, where:

\[
M_{RT}(\text{LDH/PHE}) = 131.58/(1-0.62) = 346.26 \text{ g mol}^{-1}
\]

and \(\text{H}_2\text{O} = 11.5 \text{ wt} \% \quad \Rightarrow \quad n \text{ H}_2\text{O} = 2.21 \text{ mol}\)

In the case of LDH/nitrate:

\[
M_{RT}(\text{LDH/nitrate}) = 131.58/(1-0.48) = 253.04 \text{ g mol}^{-1}
\]

because only nitrate anions are present in the interlayered space (FTIR, XRD analysis), in this case, \(\text{H}_2\text{O}\) was calculated from the difference:

\[
\text{Mass of H}_2\text{O} = M_{RT}(\text{LDH/nitrate}) - \text{Mg}_2\text{Al(OH)}_6 - \text{NO}_3^- = 253.04 - 177.58 - 62 = 13.46 \text{ g}
\]

\[
\Rightarrow \quad n \text{ H}_2\text{O} = 13.46/18.02 = 0.75 \text{ mol}
\]

It means that at 200 °C there is not only loss of water but also deshydroxylation.

**Figure S2:** TGA (a) and DTGA (b) traces of PBS and PBS nanocomposites with Mg$_2$Al LDH fillers, under air flow.
**Figure S3:** DSC traces of PBS and PBS nanocomposites with Mg₂Al LDH fillers: (a) heating scans and (b) cooling scans.

**Figure S4:** SEM micrographs of Mg₂Al LDH with phenylalanine: (a) zoom 15000x, (b) zoom 30000x.
Figure S5: UV–vis transmittance spectra of PBS and PBS nanocomposites with Mg$_2$Al LDH fillers, during photodegradation at 60 °C; (a) LDH/PHE, (b) LDH/HIS, (c) LDH/nitrate and (d) PBS.