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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

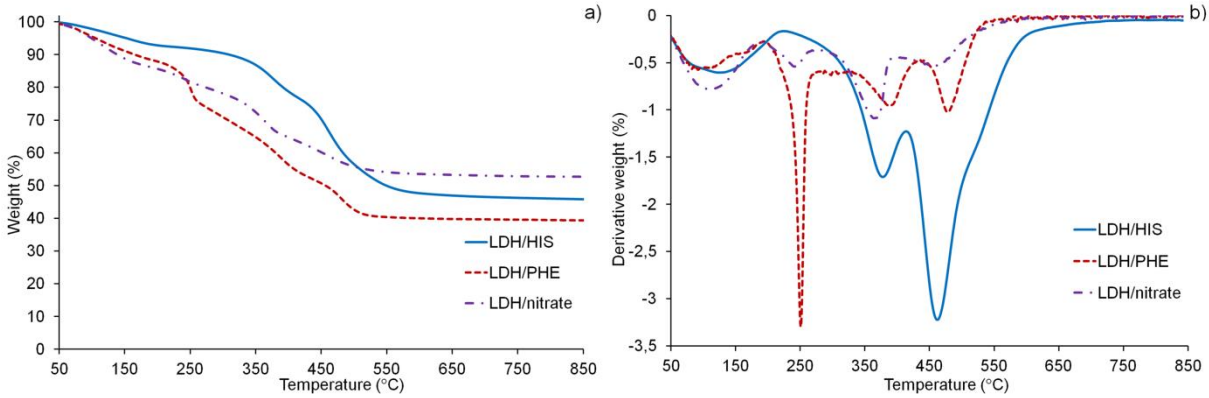

Figure S1: TGA (a) and DTGA (b) traces of Mg_2Al LDHs, under air flow

The procedure for calculation of experimental chemical compositions on example of LDH/HIS

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

$$\mathbf{[Mg_2Al(OH)_6]A^-_{(1-x)}NO_3^-{}_x\ nH_2O}.$$

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

Data: Anion HIS^- $M_w = 154.15\ g\cdot mol^{-1}$

Anion NO_3^- $M_w = 62.00\ g\cdot mol^{-1}$

Mg_2AlOH_6 $M_w = 177.64\ g\cdot mol^{-1}$

$Mg_2AlO_{7/2}$ $M_w = 131.58\ g\cdot mol^{-1}$

Mass of the residue at 800 °C ($Mg_2AlO_{7/2}$) = 55 wt %

The calculation is based on TGA traces.

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

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_2O is 7 wt %.

Mass $H_2O = M_{RT} \cdot \%H_2O = 292.4 \cdot 0.07 = 20.47$ g » n $H_2O = 20.47/18.02 = 1.14$ mol

Next, the amount of HIS and nitrate anions are calculated:

$154.15 \cdot (1-x) + 62 \cdot x = 292.4 - 177.64 - 1.14 \cdot 18.02$ » $x = 0.65$

The chemical composition for LDH/HIS is $\mathbf{[Mg_2Al(OH)_6](HIS^-)_{0.35}(NO_3^-)_{0.65}\ 1.14H_2O}$.

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

$$M_{RT}(\text{LDH/PHE}) = 131.58/(1-0.62) = 346.26 \text{ g mol}^{-1}$$
$$\text{and } H_2O = 11.5 \text{ wt \%} \text{ » } \mathbf{n}\ H_2O = 2.21 \text{ mol}$$

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, H_2O was calculated from the difference:

$$\text{Mass of } H_2O = M_{RT}(\text{LDH/nitrate}) - Mg_2Al(OH)_6 - NO_3^- = 253.04 - 177.58 - 62 = 13.46 \text{ g}$$
$$\text{» » } \mathbf{n}\ H_2O = 13.46/18.02 = 0.75 \text{ mol}$$

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

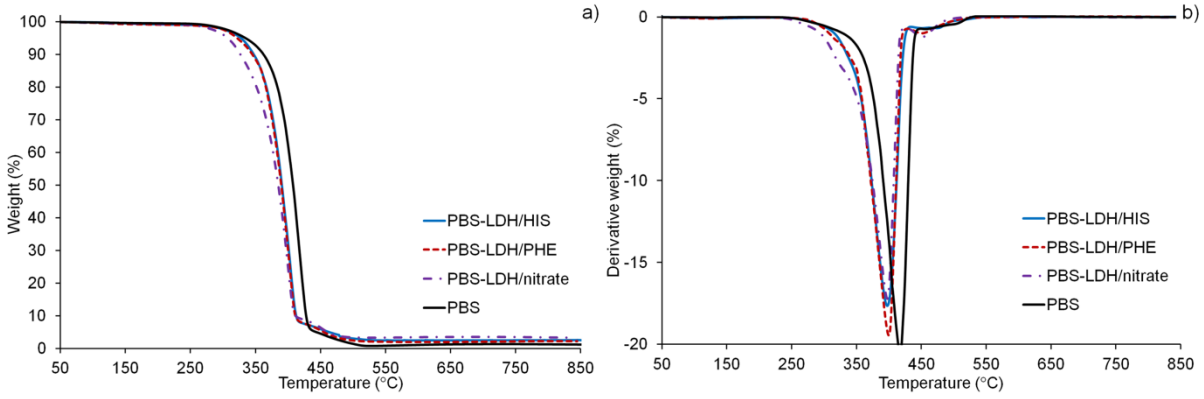

Figure S2: TGA (a) and DTGA (b) traces of PBS and PBS nanocomposites with Mg_2Al LDH fillers, under air flow.

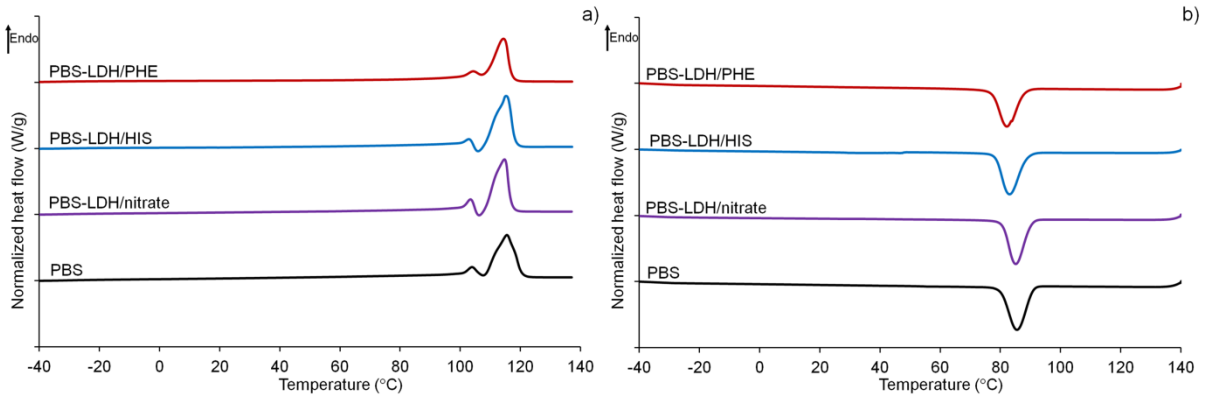

Figure S3: DSC traces of PBS and PBS nanocomposites with Mg_2Al LDH fillers: (a) heating scans and (b) cooling scans.

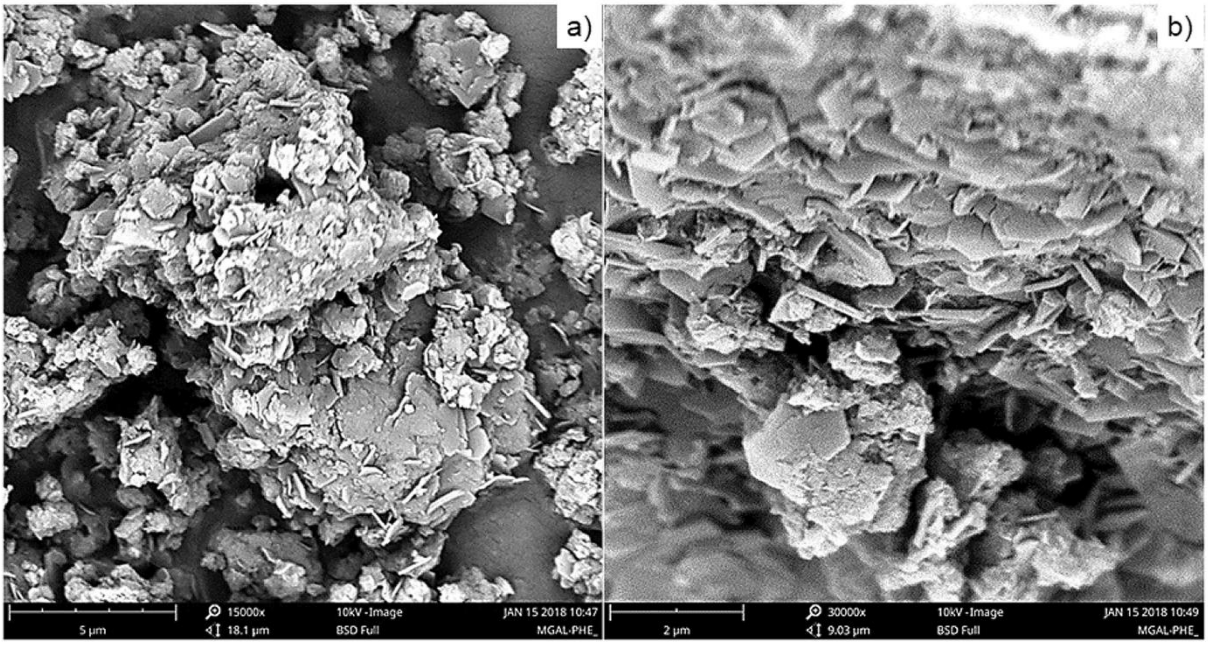

Figure S4: SEM micrographs of Mg_2Al LDH with phenylalanine: (a) zoom 15000x, (b) zoom 30000x.

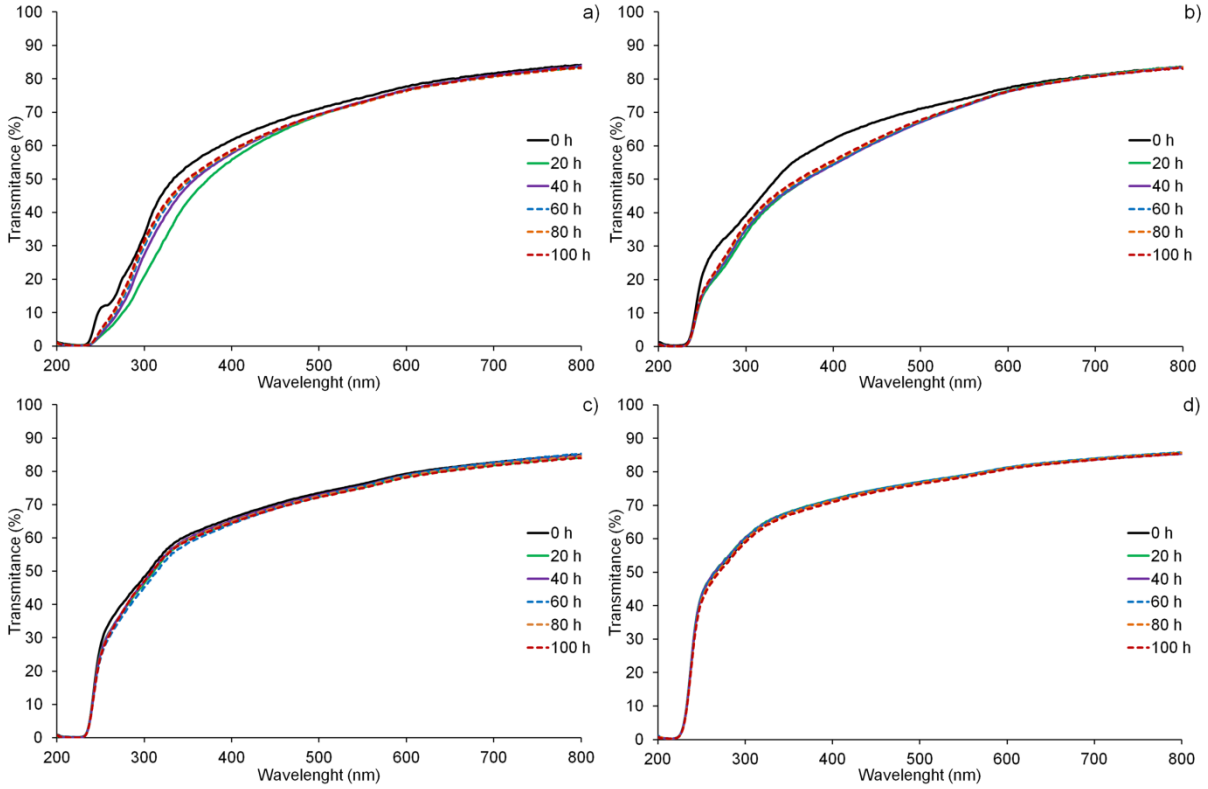

Figure S5: UV–vis transmittance spectra of PBS and PBS nanocomposites with Mg_2Al LDH fillers, during photodegradtion at 60 °C; (a) LDH/PHE, (b) LDH/HIS, (c) LDH/nitrate and (d) PBS.