coatings

MDPI

Supplementary Materials

Flame-Retardant and Fire-Sensing Packaging Papers Enabled by Diffusion-Driven Self-Assembly of Graphene Oxide and Branched Polyethyleneimine Coatings

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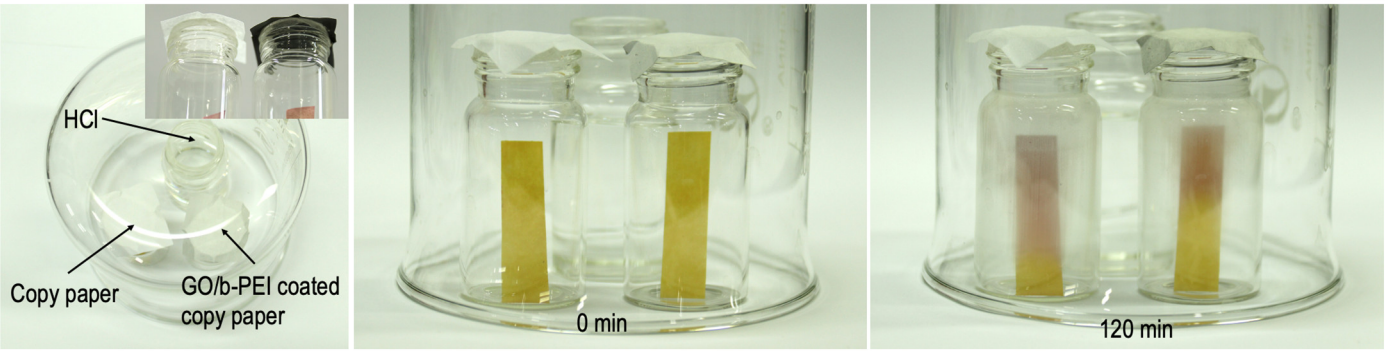

Figure S1. Vapored HCl from a vessel with concentrated HCl solution diffused into two vessels covered by pristine copy paper (**left**) and GPC-copy paper (**right**) and caused the color change of pH test papers. pristine copy paper and GPC-copy paper were fixed to the vessel mouth with tape and ensured to be sealed.

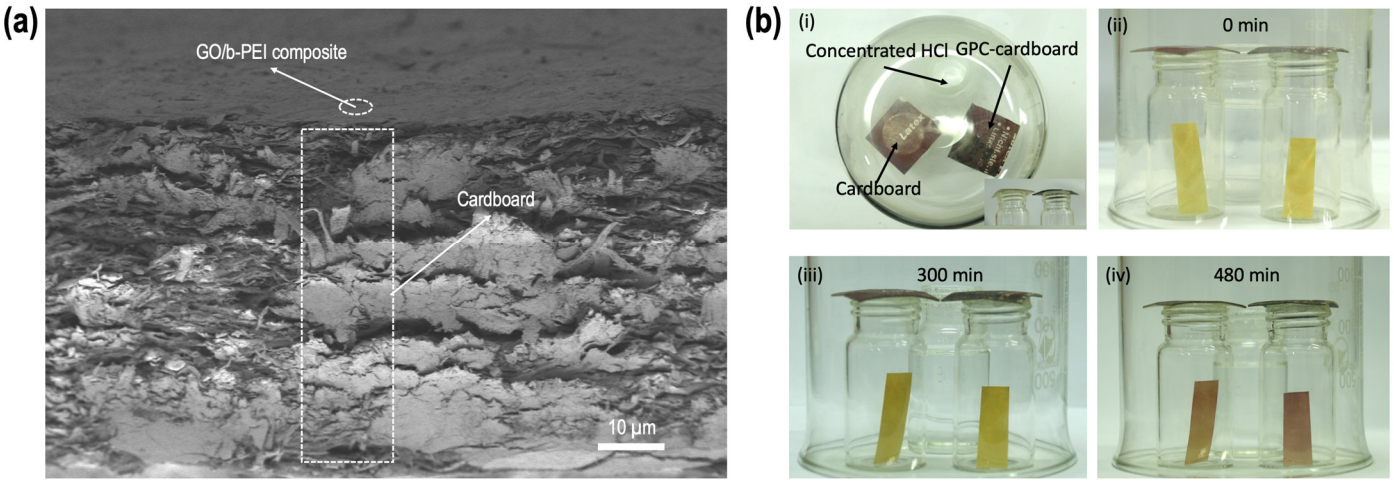

Figure S2. Effect of the GO/b-PEI on cardboard for water-resistance. (**a**) Cross-sectional SEM image of GPC-cardboard. (**b**) Vapored HCl from a vessel with concentrated HCl solution diffused into two vessels covered by pristine cardboard (left) and GPC-cardboard (right) and caused the color change of pH test papers. Pristine cardboard and GPC-cardboard were fixed to the vessel mouth with tape and ensured to be sealed.

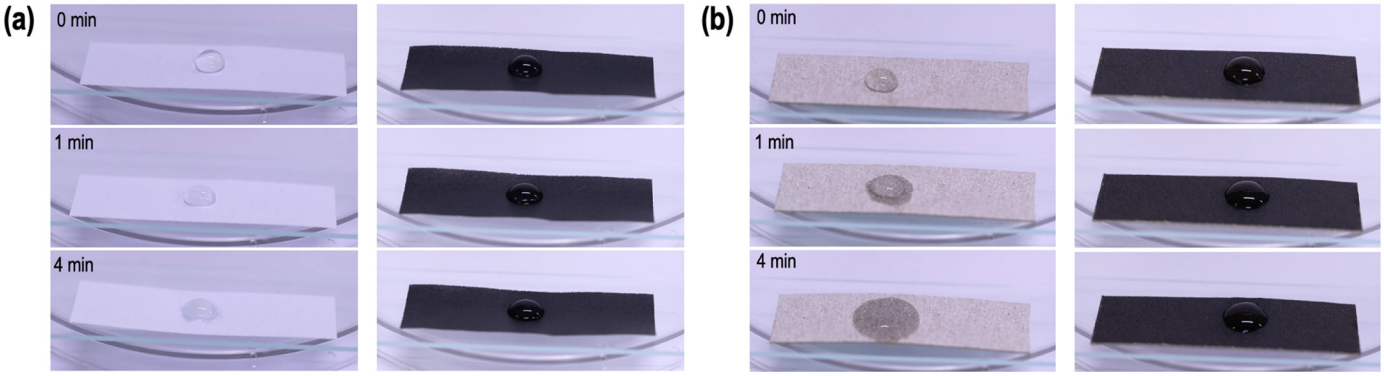

Figure S3. Photographs of water droplets staying on the surfaces of (**a**) copy paper and GPC-copy paper, as well as (**b**) cardboard and GPC-cardboard.

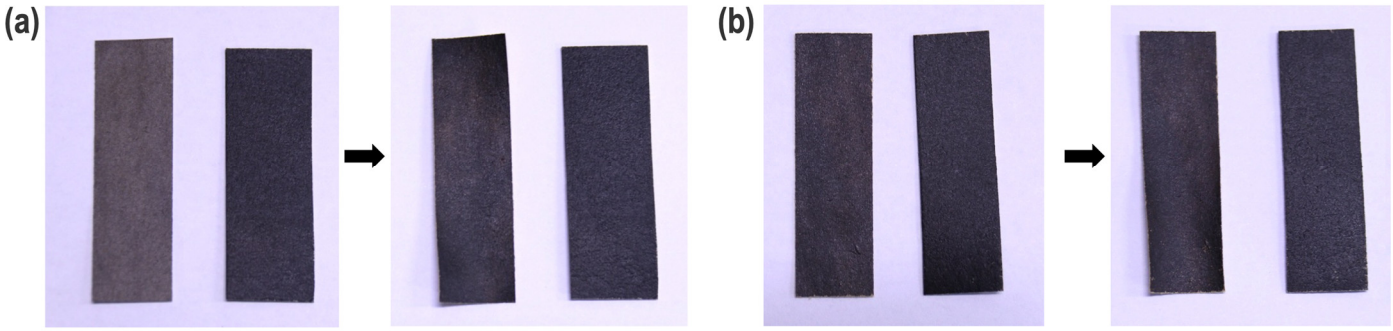

Figure S4. GPC-kraft paper (left) and GPC-carboard (right) were treated with (**a**) water immersion of 4 hours and (**b**) water immersion of 15 minutes and ultrasonication of 1 min, respectively.

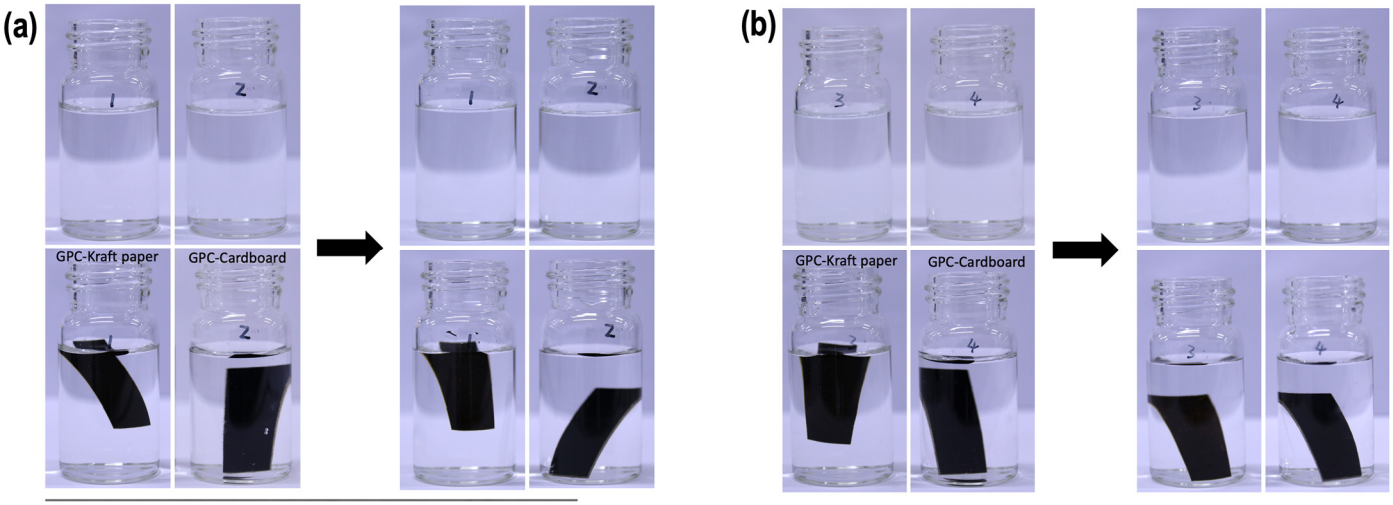

Figure S5. (**a**) Photographs showing the water solution from GPC-kraft paper and GPC-cardboard after 4 hours of water immersion. (**b**) Photographs showing the water solution from GPC-kraft paper and GPC-cardboard after 15 minutes of water immersion followed by 1 minute of ultrasonication.

Table S1. Mass of GPC-kraft paper and GPC-carboard samples before and after treatment of 4 hours water immersion and 15 minutes water immersion combined with ultrasonication of 1 min.

Name	**Kraft paper (g)**	**GPC-kraft paper (g)**	**GPC-kraft paper (g)**	**GPC-kraft paper (g)**	**Cardboard (g)**	**GPC-card-board (g)**	**GPC-card-board (g)**	**GPC-card-board (g)**
Number	Reference	Set1	Set2	Set3	Reference	Set1	Set2	Set3
Immersion-before	0.0393	0.0387	0.0371	0.0374	0.1423	0.1485	0.1339	0.1039
Immersion-after	0.0387	0.0386	0.037	0.0371	0.1411	0.1467	0.1312	0.1028
Sonication-before	0.0403	0.0405	0.0385	0.0386	0.1433	0.1521	0.1388	0.1174
Sonication-after	0.0399	0.0404	0.0385	0.0385	0.1429	0.1501	0.1384	0.1171

Table S2. Mass loss rate of GPC-kraft paper and GPC-carboard samples treated with water immersion of 4 hours and water immersion of 15 minutes and ultrasonication of 1 min, respectively. **Table S2.** Mass loss rate of GPC-kraft paper and GPC-carboard samples treated with water immersion of 4 hours and water immersion of 15 minutes and ultrasonication of 1 min, respectively.

Name	**Kraft paper (%)**	**GPC-kraft paper (%)**	**GPC-kraft paper (%)**	**GPC-kraft paper (%)**	**Cardboard (%)**	**GPC-card-board (%)**	**GPC-card-board (%)**	**GPC-card-board (%)**
Number	Reference	Set1	Set2	Set3	Reference	Set1	Set2	Set3
Immersion	−1.53%	-0.26%	−0.27%	−0.80%	−0.84%	−1.21%	−2.02%	−1.06%
Immersion and sonication	−0.99%	−0.25%	0	−0.26%	−0.28%	−1.31%	−0.29%	−0.26%