

## Supplementary Materials: Flammability of Cellulose-Based Fibers and the Effect of Structure of Phosphorus Compounds on Their Flame Retardancy

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**Figure S1.** Optical image of (A) P-Cell knitted textiles; (B) P-Cell yarns; (C) P-Cell brown fibers; and (D) P-Cell white fibers.

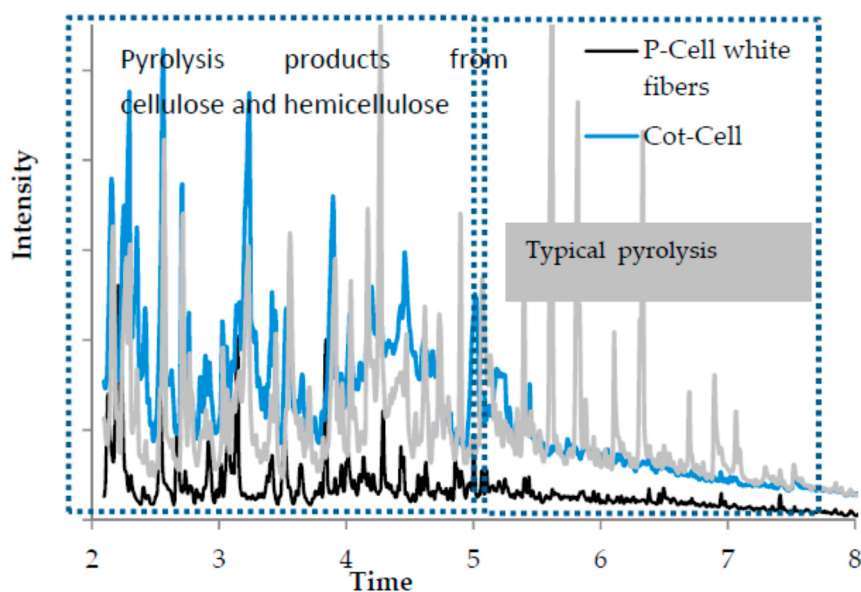


Figure S2. PY-GC-MS chromatogram of P-Cell and Cot-Cell fibers.

Table S1. Major pyrolysis products of P-Cell white fibers.

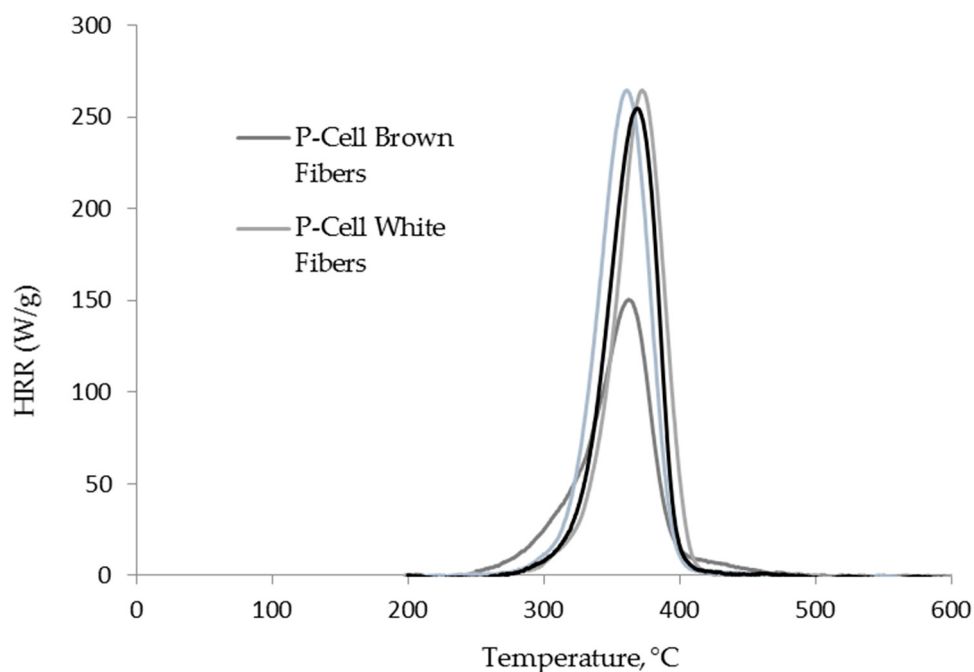
| Peak No | Time, min | Area, % | Pyrolysis products                  | CAS No.      |
|---------|-----------|---------|-------------------------------------|--------------|
| 4       | 2.539     | 10.77   | Furfural                            | 000098-01-1  |
| 6       | 2.924     | 5.52    | Styrene                             | 000100-42-5  |
| 6       | 2.924     | 5.52    | 1,3,5,7-Cyclooctatetraene           | 000629-20-9  |
| 6       | 2.924     | 5.52    | Bicyclo[4.2.0]octa-1,3,5-triene     | 000694-87-1  |
| 7       | 3.019     | 2.25    | 2-Cyclopenten-1-one, 2-methyl-      | 001120-73-6  |
| 7       | 3.019     | 2.25    | 2,4-Dimethylfuran                   | 003710-43-8  |
| 9       | 3.149     | 9.17    | 1,2-Cyclopentanedione               | 003008-40-0  |
| 11      | 3.517     | 6.00    | Phenol                              | 000108-95-2  |
| 11      | 3.517     | 6.00    | Phosphonic acid, (p-hydroxyphenyl)- | 033795-18-5  |
| 13      | 3.843     | 7.79    | 1,2-Cyclopentanedione, 3-methyl-    | 000765-70-8  |
| 13      | 3.843     | 7.79    | 2-Cyclopenten-1-one, 2-hydroxy-3    | 000080-71-7  |
| 15      | 4.139     | 2.81    | p-Cresol                            | 000106-44-5  |
| 15      | 4.139     | 2.81    | Phenol, 3-methyl-                   | 000108-39-4  |
| 17      | 4.430     | 2.23    | 2-Cyclopenten-1-one, 3-ethyl-2-h    | 021835-01-8  |
| 19      | 5.005     | 1.93    | 1,4:3,6-Dianhydro-.alpha.-d-gluc    | 1000098-14-8 |

Table S2. Major pyrolysis products of Cot-Cell fibers.

| Peak No | Time, min | Area, % | Pyrolysis products               | CAS No.     |
|---------|-----------|---------|----------------------------------|-------------|
| 9       | 3.143     | 5.47    | 2(5H)-Furanone                   | 000497-23-4 |
| 11      | 3.416     | 3.80    | 2-Furancarboxaldehyde, 5-methyl- | 000620-02-0 |
| 13      | 3.546     | 3.29    | Phenol                           | 000108-95-2 |
| 14      | 3.896     | 6.61    | 1,2-Cyclopentanedione, 3-methyl- | 000765-70-8 |
| 14      | 3.896     | 6.61    | 2-Cyclopenten-1-one, 2-hydroxy-3 | 000080-71-7 |
| 15      | 4.026     | 2.62    | Phenol, 2-methyl-                | 000095-48-7 |
| 15      | 4.026     | 2.62    | Phenol, 3-methyl-                | 000108-39-4 |

**Table S3.** Major pyrolysis products of P-Cell brown fibers.

| Peak No | Time,min | Area, % | Pyrolysis products                  | CAS No.     |
|---------|----------|---------|-------------------------------------|-------------|
| 3       | 2,716    | 2.20    | 2-Furanmethanol                     | 000098-00-0 |
| 5       | 2,870    | 0.46    | Phenol                              | 000108-95-2 |
| 6       | 2,899    | 0.55    | 4-Cyclopentene-1,3-dione            | 000930-60-9 |
| 8       | 3,036    | 1.02    | 2-Cyclopenten-1-one, 2-methyl-      | 001120-73-6 |
| 17      | 3,563    | 3.82    | Phenol                              | 000108-95-2 |
| 17      | 3,563    | 3.82    | Phosphonic acid, (p-hydroxyphenyl)- | 033795-18-5 |
| 17      | 3,563    | 3.82    | 2-Vinylfuran                        | 001487-18-9 |
| 24      | 3,913    | 3.25    | 1,2-Cyclopentanedione, 3-methyl-    | 000765-70-8 |
| 24      | 3,913    | 3.25    | 2-Cyclopenten-1-one, 2-hydroxy-3... | 000080-71-7 |
| 30      | 4,174    | 2.97    | p-Cresol                            | 000106-44-5 |
| 30      | 4,174    | 2.97    | Phenol, 3-methyl-                   | 000108-39-4 |
| 30      | 4,174    | 2.97    | Phenol, 2-methyl-                   | 000095-48-7 |
| 32      | 4,275    | 5.63    | Phenol, 2-methoxy-                  | 000090-05-1 |
| 32      | 4,275    | 5.63    | Mequinol                            | 000150-76-5 |
| 32      | 4,275    | 5.63    | 2-Acetyl-5-methylfuran              | 001193-79-9 |
| 39      | 4,618    | 2.44    | Phenol, 2,4-dimethyl-               | 000105-67-9 |
| 39      | 4,618    | 2.44    | Phenol, 3,5-dimethyl-               | 000108-68-9 |
| 41      | 4,737    | 2.13    | Phenol, 3-ethyl-                    | 000620-17-7 |
| 41      | 4,737    | 2.13    | Phenol, 4-ethyl-                    | 000123-07-9 |
| 41      | 4,737    | 2.13    | Phenol, 2-ethyl-                    | 000090-00-6 |
| 44      | 4,903    | 2.27    | Creosol                             | 000093-51-6 |
| 44      | 4,903    | 2.27    | 2-Methoxy-5-methylphenol            | 001195-09-1 |
| 58      | 5,620    | 5.07    | 2-Methoxy-4-vinylphenol             | 007786-61-0 |
| 62      | 5,822    | 4.18    | Phenol, 2,6-dimethoxy-              | 000091-10-1 |
| 71      | 6,331    | 3.55    | Phenol, 2-methoxy-4-(1-propenyl)    | 005912-86-7 |
| 71      | 6,331    | 3.55    | trans-Isoeugenol                    | 005932-68-3 |
| 71      | 6,331    | 3.55    | Phenol, 2-methoxy-4-(1-propenyl)    | 000097-54-1 |

**Figure S3.** PCFC data for cellulose textiles.

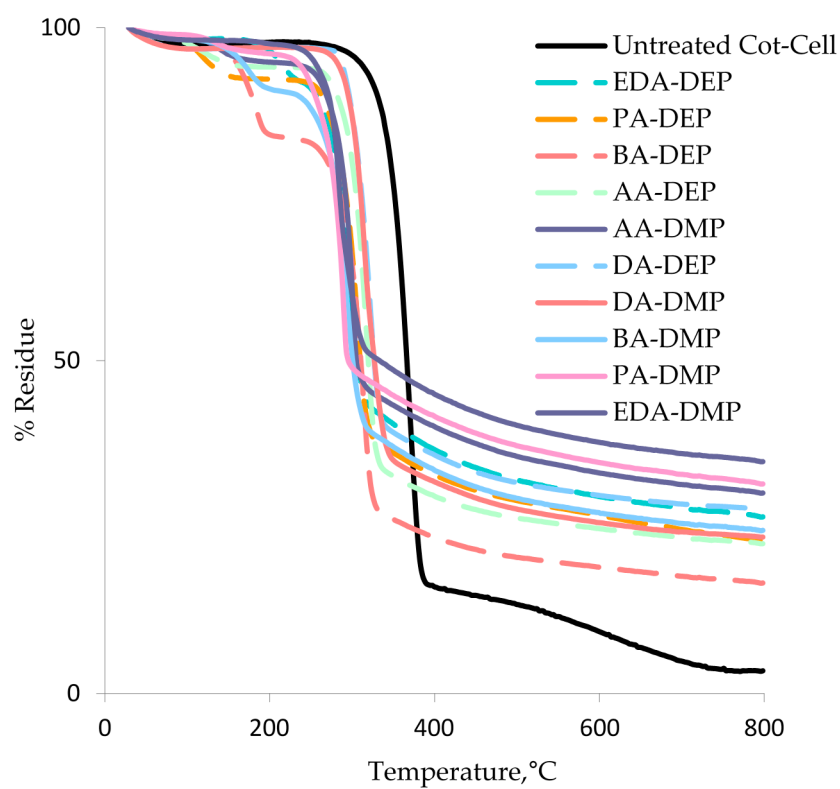


Figure S4. TGA data for FR-treated Cot-Cell.

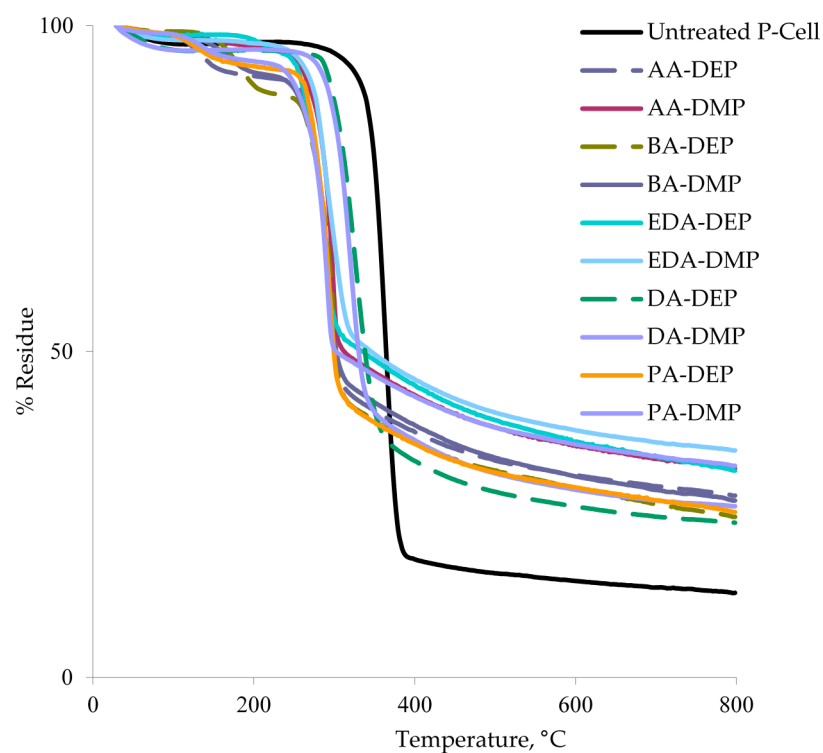
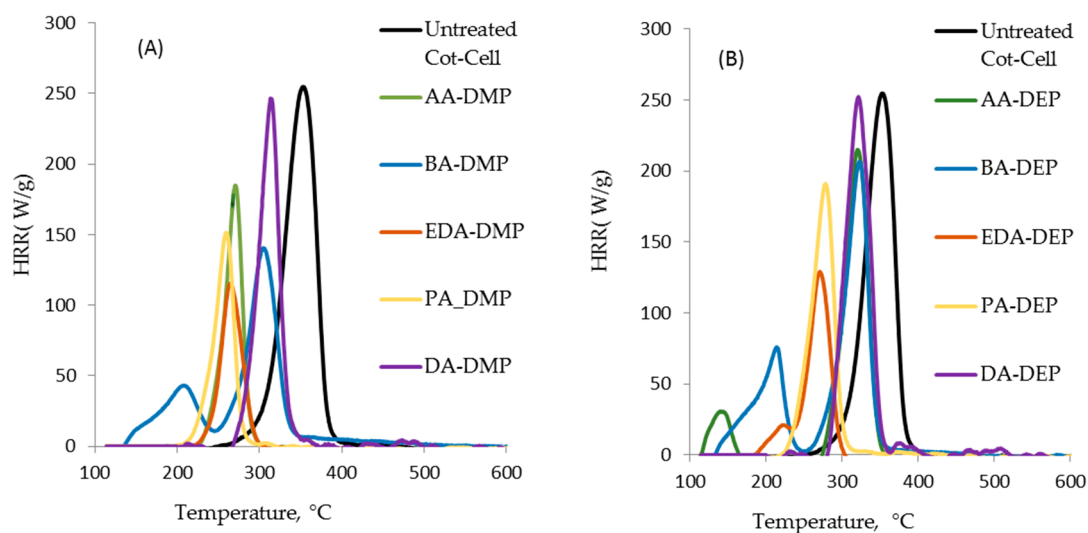
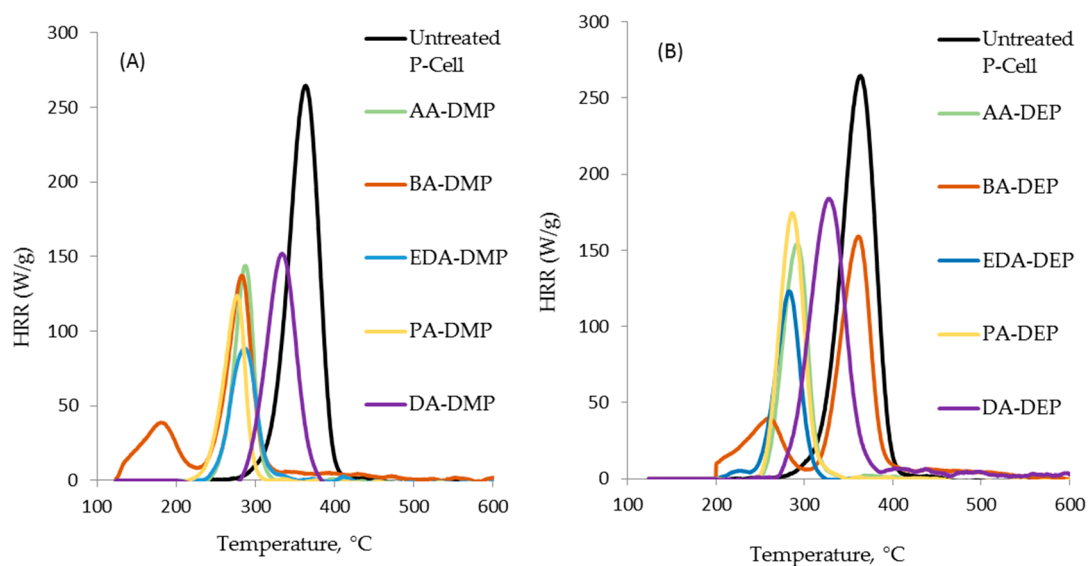


Figure S5. TGA data for FR-treated P-Cell.



**Figure S6.** PCFC data for FR-treated Cot-Cell with phosphoramidates of methyl phosphoester derivatives (A) and ethyl phosphoester derivatives (B).



**Figure S7.** PCFC data for FR-treated P-Cell with phosphoramidates of methyl phosphoester derivatives (A) and ethyl phosphoester derivatives (B).

