SUPPLEMENTARY MATERIAL

Phosphorous-nitrogen-sulfur (P/N/S)-containing polymer for enhanced cotton flame retardancy

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Figure S1. ^{1}H-NMR (a) and ^{31}P-NMR (b) spectra of DVP.

Figures S2. FT-IR/ATR spectra of untreated (COT)- and DVP-CYSS-treated (COT/ DVP-CYSS) cotton (**a**), and table reporting the assignments of each peak, along with the corresponding vibration modes and relative intensities (**b**).

[1]H-NMR characterization of DVP

The chemical structure of DVP was assessed by ^{1}H- and ^{31}P-NMR, collecting spectra in D_2O at 25 °C using a Bruker Advance 300 NMR spectrometer (Milan, Italy). Proton chemical shifts are reported in ppm (δ) with the solvent reference relative to tetramethylsilane (TMS) employed as the internal standard ($CDCl_3$ δ = 7.26 ppm). ^{31}P NMR spectra were recorded on a 300 MHz spectrometer (Bruker Avance 300) operating at 121.2 MHz, with complete proton decoupling. Phosphorous chemical shifts are reported in ppm (δ) relative to H_3PO_4 as external standard.

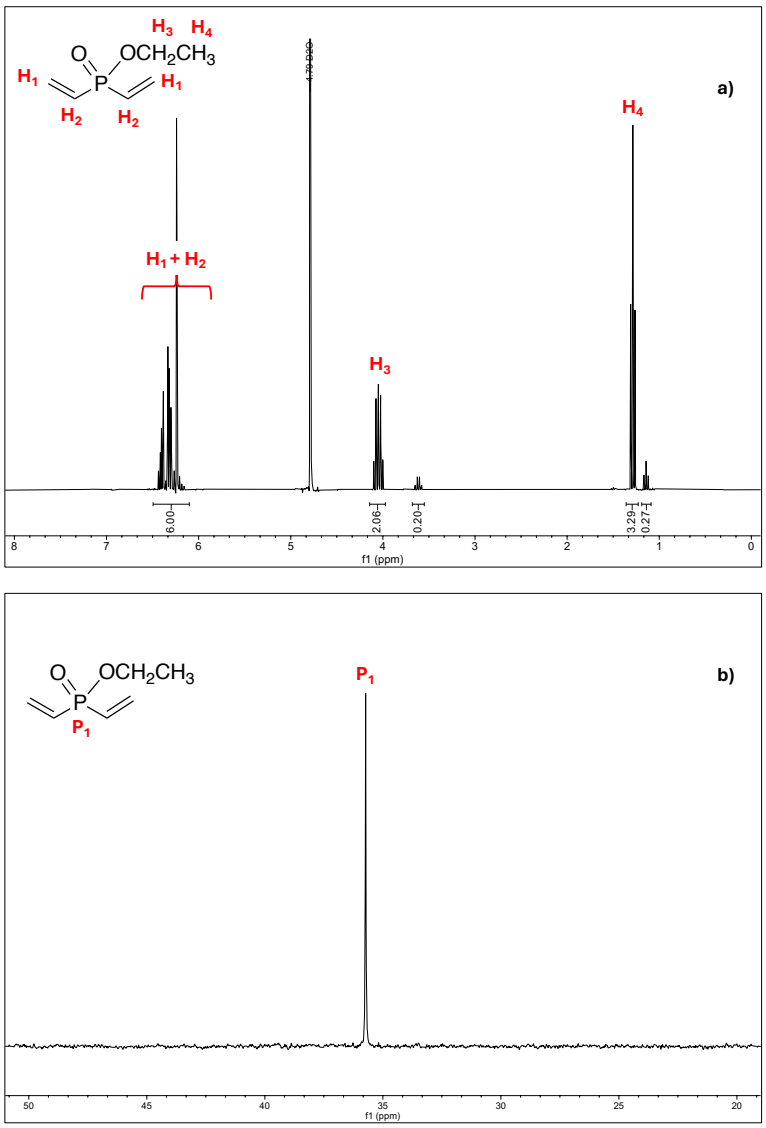
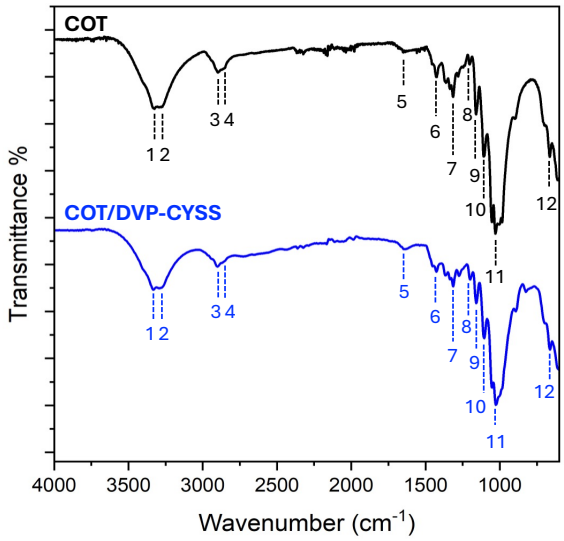


Figure S1. ^{1}H-NMR (**a**) and ^{31}P-NMR (**b**) spectra of DVP.

FT-IR/ATR characterization of COT and COT/DVP-CYSS

Untreated cotton (COT) and COT/DVP-CYSS were analyzed at by attenuated total reflectance (ATR) Fourier transform infrared spectroscopy (FT-IR). FT-IR/ATR spectra were recorded at room temperature, in the 4000 - 600 cm^{-1} wavenumber range, with 32 scans and 4 cm^{-1} resolution, using a Jasco 4600 FT-IR/ATR spectrophotometer (Milan, Italy), equipped with a diamond crystal (penetration depth: 1.66 µm).



Peak n°	Wavenumber (cm^{-1})	Intensity	Assignments
1	3328	s	ν O-H intramolecular b
2	3277	s	ν O-H intermolecular b
3	2897	s	ν C-H asymmetric
4	2860	s	ν C-H symmetric
5	1640	w	δ O-H
6	1482	m	δ CH_2 scissoring
7	1365	w	δ C-H + ν C-O asymm
8	1250	w	ν C-O asymmetric + ν
9	1165	s	ν C-O-C asymmetr
10	1109	s	ν C-O symmetric + ν
11	1021	m	ν C-O pyranose rin
12	660	w	ring vibrations
1	3328	s	ν O-H intramolecular b
2	3270	s	ν O-H intermolecular b
3	2895	s	ν C-H asymmetric
4	2866	s	ν C-H symmetric
5	1639	w	δ O-H
6	1480	w	δ CH_2 scissoring
7	1365	w	δ C-H + ν C-O asymm
8	1245	w	ν C-O asymmetric + ν
9	1166	s	ν C-O-C asymmetr
10	1111	s	ν C-O symmetric + ν
11	1023	m	ν C-O pyranose rin
12	663	w	ring vibrations

Figure S2. FT-IR/ATR spectra of untreated (COT)- and DVP-CYSS-treated (COT/ DVP-CYSS) cotton (**a**), and table reporting the assignments of each peak, along with the corresponding vibration modes and relative intensities (**b**).