SUPPLEMENTARY MATERIAL

Enhancing the flame resistance of cotton via N-acryloylglycine-based chemical functionalization

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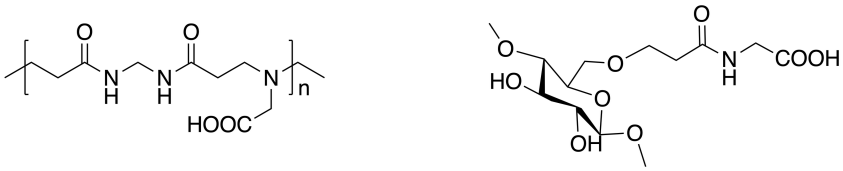
Pages S1-S6

1. *Comparison of the chemical structure of M-GLY repeat unit and NAG-grafted moiety on cotton*



M-GLY Product of N-acrylolglycine grafting on cotton

Figure S1. Chemical structure of the repeat unit of the polyamidoamine coded M-GLY (a) and of the oxo-Michael addition product of N-acryloylglycine with cotton hydroxyl groups (b).

2. Nuclear magnetic resonance characterization of N-acryloylglycine

The chemical structure of N-acryloylglycine (NAG) was assessed by ^{1}H-, ^{13}C-, COSY- and HSQC-NMR, collecting spectra in D_2O at pH 4.0 and at 25°C using a Bruker Advance DPX-400 NMR spectrometer (Milan, Italy) operating at 400.13 MHz. Parameters: scan number 32, relaxation delay, *d1*, 10.0 s, receiver gain automatically measured and set by the instrument. Deuterium oxide (D_2O, >99.9%) was supplied by Sigma-Aldrich (Milan, Italy) and used as received. Figure S1 reports the COSY- (a) and HSQC-NMR (b) spectra of N-acryloylglycine, whereas the ^{1}H- and ^{13}C-NMR spectra are reported in the manuscript (Figure 2).

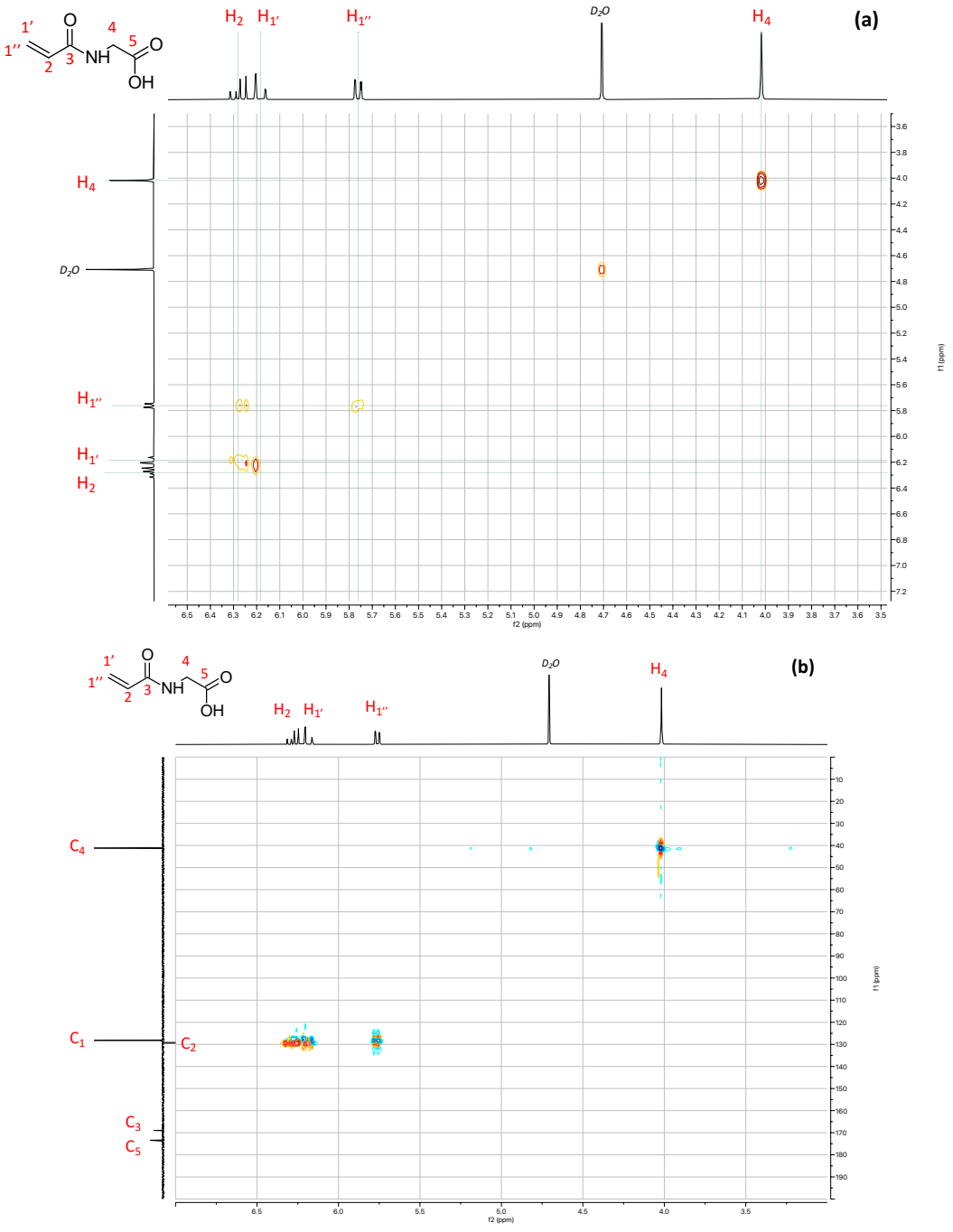


Figure S2. COSY- (a) and HSQC-NMR (b) spectra of N-acryloylglycine.

3. FT-IR/ATR characterization of NAG-grafted cotton fabrics

COT, NAG, COT-g-NAG$_3$ and COT-g-NAG$_6$ were analyzed 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 64 scans and 8 cm^{-1} resolution, using a Jasco FT-IR/FIR spectrophotometer (Milan, Italy), equipped with a diamond crystal.

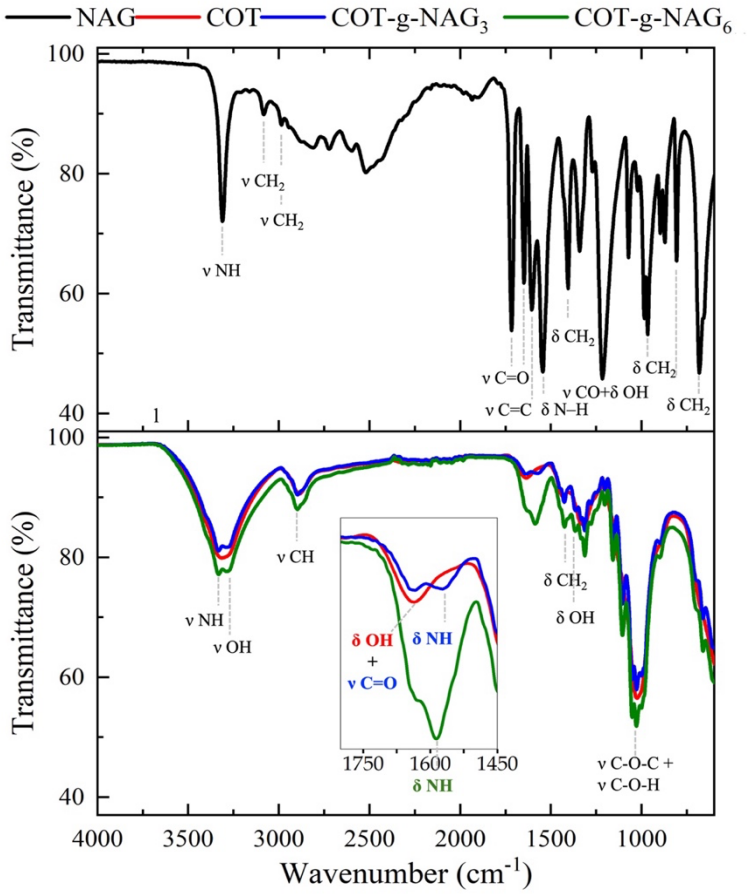


Figure S3. FT-IR/ATR spectra of N-acryloylclycine (black line), virgin cotton (COT, red line), COT-g-NAG$_3$ (blue line) and COT-g-NAG$_6$ (green line) fabrics.

Table S1. Assignments in FT-IR/ATR spectra of NAG (black), COT (red), COT-g-NAG_3 (blue) and COT-g-NAG_6 (green).

Wavenumber (cm^{-1})	**Assignment**
3309	ν NH
3090	ν CH_2 sp2
2800-3000	ν CH_2 sp3
1718	ν C=O carboxylic acid
1648	ν C=O amide (amide I)
1608	ν C=C
1544	δ N–H (amide II)
1300 - 1405	δ CH_2
1216	ν CO + δ OH of acid group
995	δ CH_2 of CH_2=CH
3300	ν OH
2780 - 2980	ν CH_2
1630	δ OH (H_2O)
1300 - 1405	δ CH_2
1000-1160	ν C-O-C, ν C-O-H
3350	**ν NH**
3280	ν OH
2780 - 2980	ν CH
1635	**ν C=O + δ OH (H_2O)**
1571	**δ NH**
1300-1430	δ CH_2
1000-1160	ν C-O-C, ν C-O-H
3350	**ν NH**
3280	ν OH
2780 - 2980	ν CH
1635	**ν C=O + δ OH (H_2O)**
1571	**δ NH**
1300-1430	δ CH_2
1000-1160	ν C-O-C, ν C-O-H

4. Solid state NMR characterization of M-GLY-grafted cotton fabrics

Solid-state NMR (ssNMR) spectra were carried out on a Bruker AVANCE NEO NMR spectrometer operating at Larmor frequencies of 125.77, and 50.68 MHz for ^{13}C and ^{15}N nuclei, respectively. See section 2.2.4 of the main text for the description of the experimental conditions.

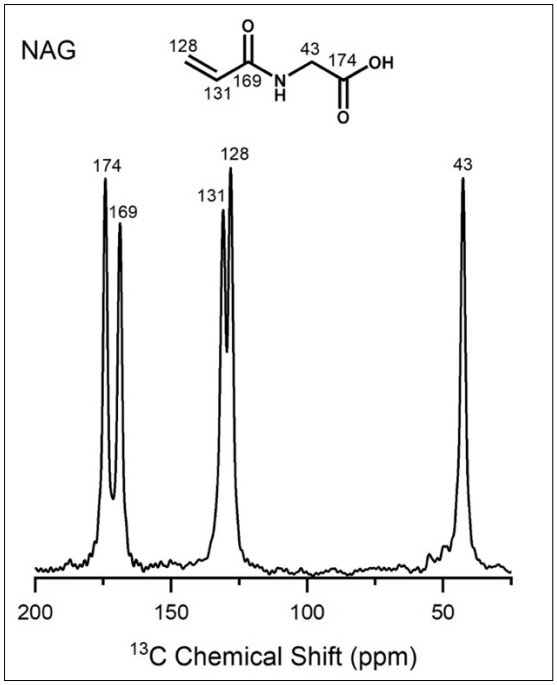


Figure S4. ^{13}C CP-MAS spectrum of NAG (contact time=2 ms, recycle delay= 20 s).

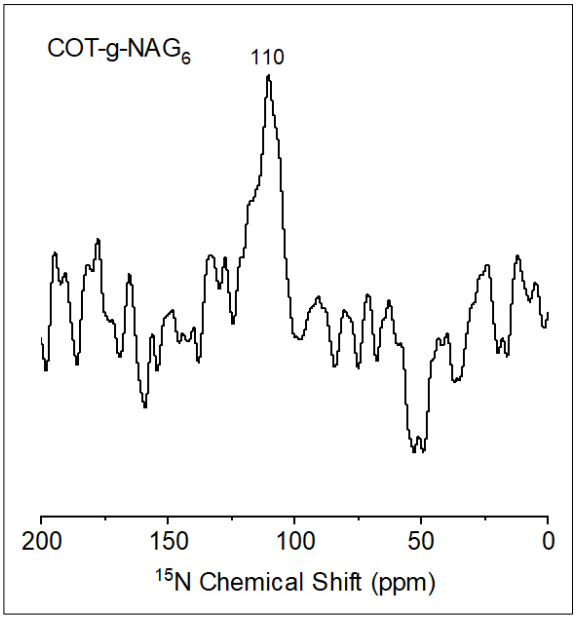


Figure S5. ^{15}N CP-MAS spectrum of COT-g-NAG_6 (contact time=2.5 ms, recycle delay=4 s).