Supporting information

Self-healing of the superhydrophobicity by ironing for the abrasion durable superhydrophobic cotton fabrics

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Radiation induced graft polymerization

The cotton fabrics (15 cm × 10 cm) were extracted for 24 h by acetone in a Soxhlet apparatus and dried in a vacuum before use. Then the samples were put into glass tubes, and methanol solutions with a defined alkyl methacrylate monomer concentration were added to keep the samples immersed. The tubes were ultrasonicated for 15 min and purged with nitrogen for 10 min to remove oxygen, then sealed and irradiated in a ^{60}Co γ-ray source at a constant dose rate of 1.76 kGy h^{-1} at room temperature for 17 h where the total absorbed dose was 30 kGy.

After the graft polymerization, the samples were extracted for 72 h by ethyl acetate in a Soxhlet apparatus to remove any residual monomer and homopolymer. Finally, the grafted cotton fabrics were first air dried and then kept under vacuum at 60^{o}C until a constant weight was obtained.

The DGs of the samples were determined as the weight increase of the samples, according to the following equation:

$$DG(\%) = \frac{W_g - W_0}{W_0} \times 100\% \qquad \text{(S1)}$$

Where, W_g and W_0 are the weights of the samples after and before grafting, respectively.

Characterizations

Surface morphology study. Low-resolution SEM images of the fabrics were taken on a S4800 SEM (Hitachi, Japan). Samples were attached using carbon tape and sputtered with gold. The voltage was set at 20 kV and the current was set at 10 μA.

FT-IR spectra of the pristine and grafted cotton fabrics. The FT-IR measurement was taken on the Nicolet Avatar FT-IR spectrometer (Thermo Nicolet Company, USA)

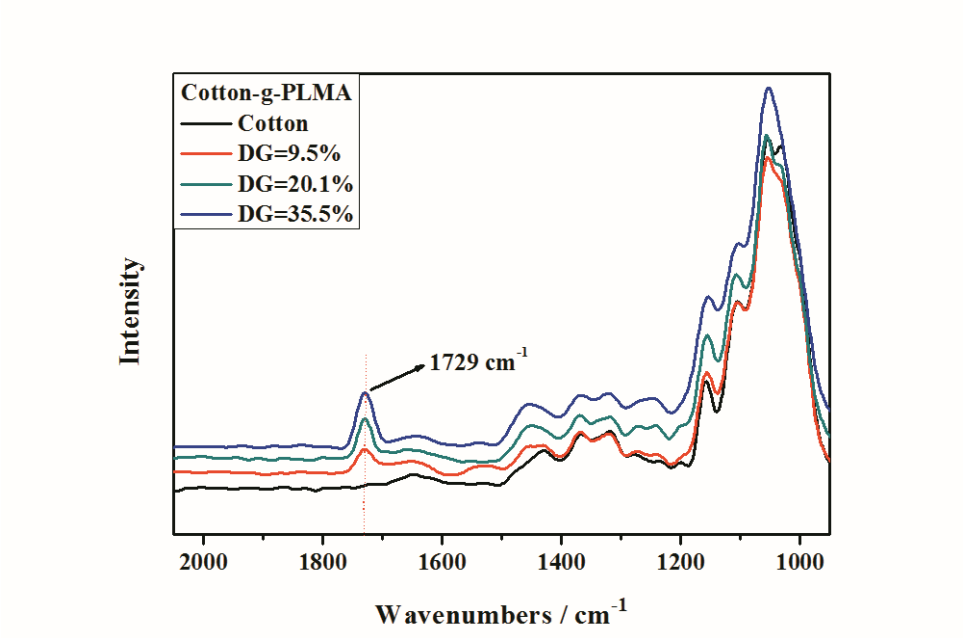

Figure S1. FT-IR spectra of the pristine cotton fabric and the PLMA grafted cotton fabric with different DGs. The absorbant bands at 1729 cm^{-1}, which is absent in the spectrum of the pristine cotton fabric, can be attributed to the ester groups in the PLMA graft chains, and the intensity of this band increases with a higher DG.

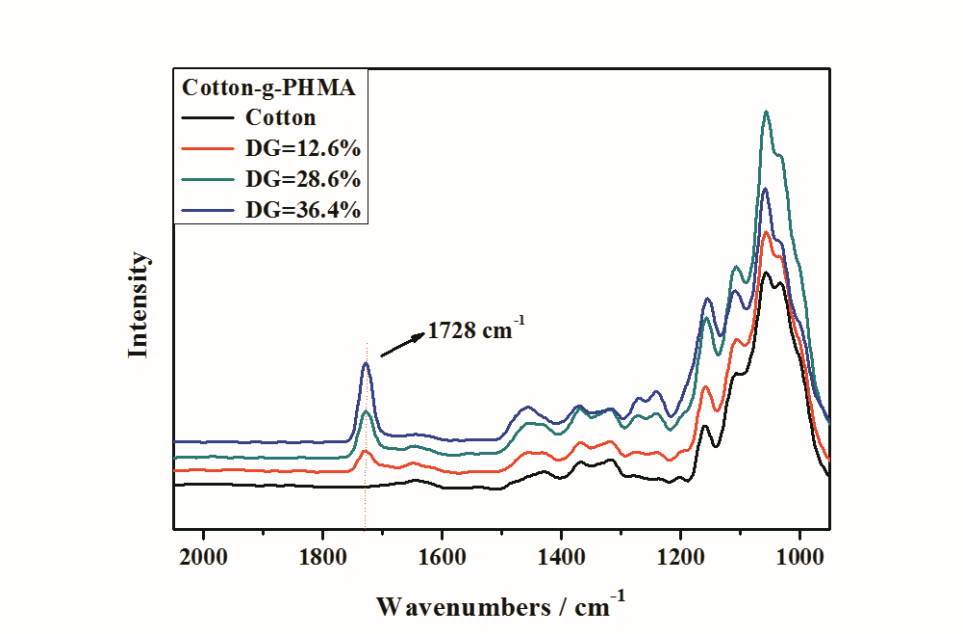

Figure S2. FT-IR spectra of the pristine cotton fabric and the PHMA grafted cotton fabric with different DGs.

Figure S3. The CA of the pristine cotton fabric is about 25^{o}.

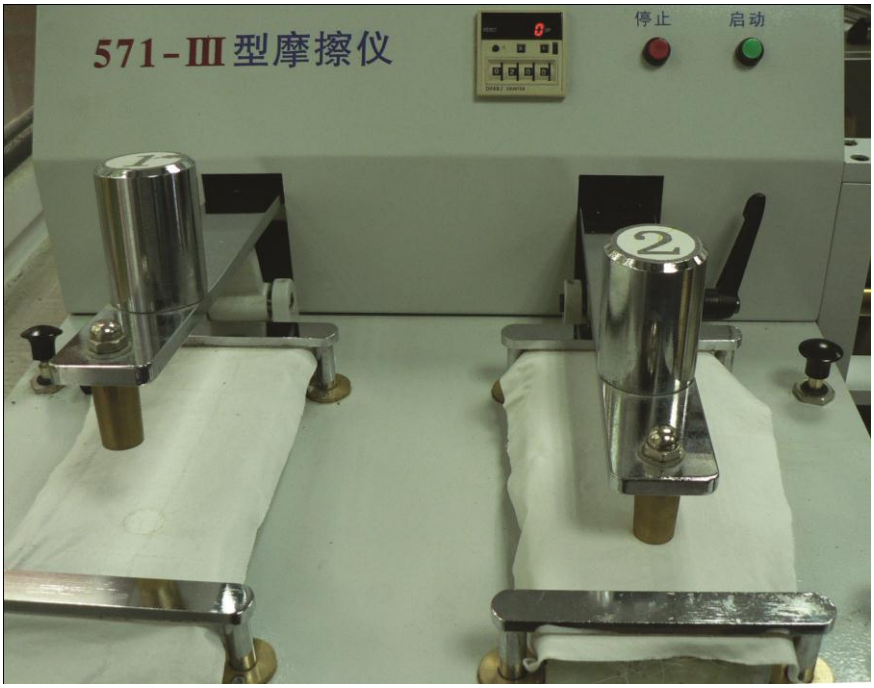

Figure S4. The automatic crockmeter for the abrasion test.

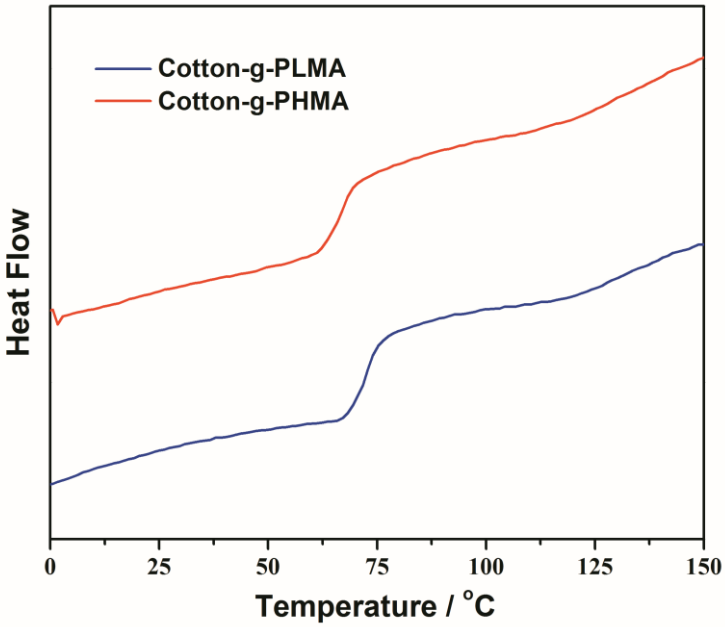

Figure S5. DSC curves of the PLMA and PHMA grafted cotton fabrics. The Tg transitions at about 75°C are attributed to the grafted polymethacrylate chains.