Constructing a Novel Complex Retanning System for Aldehyde-tanned Leather Based on Polyacrylic Acid and Gemini Polyurethane Surfactant

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Abstract

In this study, a novel complex retanning system composed of polyacrylic acid (PAA) and gemini polyurethane surfactant (PUGs) was constructed for aldehyde-tanned leather. In this novel complex retanning system, PUGs with higher surface activity can promote the penetration of PAA into the leather, and then they form composite aggregates by the intermolecular hydrogen bonding under low pH condition to exist steadily in leather. The results showed that this complex retanning system not only could endow the resultant leather with better mechanical properties, but also effectively reduce the free formaldehyde content in the resultant leather. When the total dosage of the retanning agent was 6 wt% and the pH value of retanning late stage was 4.0, the retanning effect was the best. The thickeness, elongation and tear strength of the resultant leather improved by 8.5%, 14.5% and 18.4%, respectively. Meanwhile, the formaldehyde content in the resultant leather decreased by 30.0%. This complex retanning system paves a new way to the development of the retanning agent of chrome-free tanned leather, benefiting to meet growing demands for related technologies toward eco-friendly leather manufacture.

Results

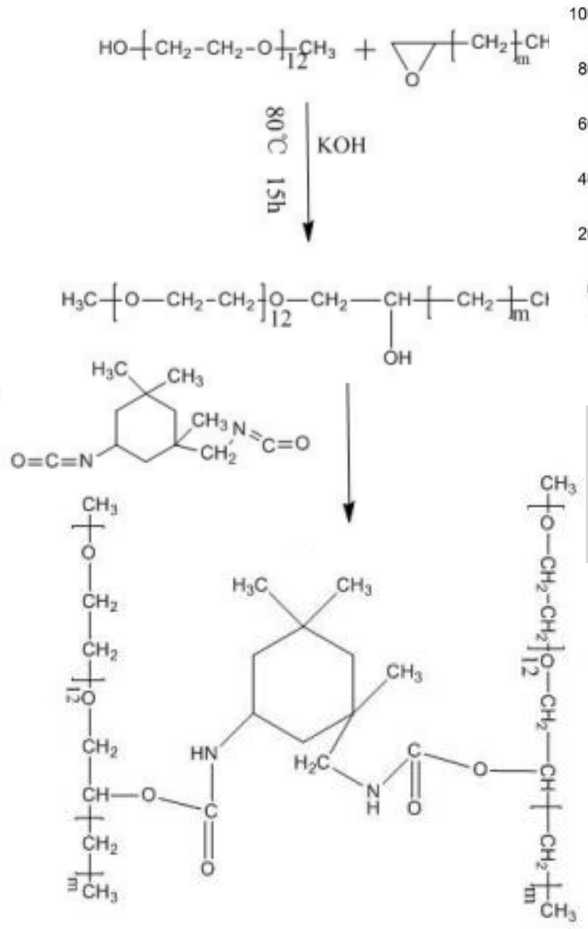

Figure 1. Synthesis route of PUGs.

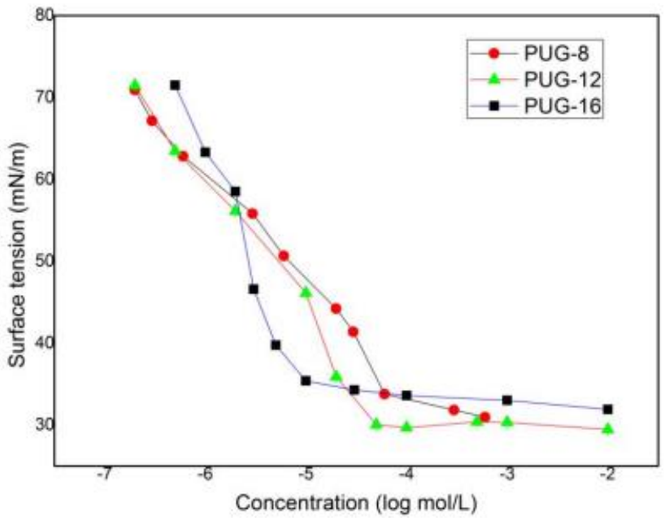

Figure 2. Surface tension as a function of the logarithm concentration of PUGs (PUG-8, PUG-10, and PUG-12) aqueous solution.

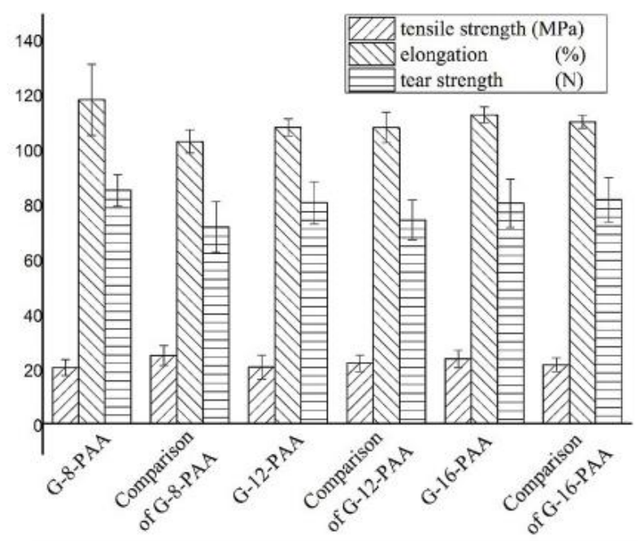

Figure 3. Mechanical properties of leathers treated with different complex retanning Systems.

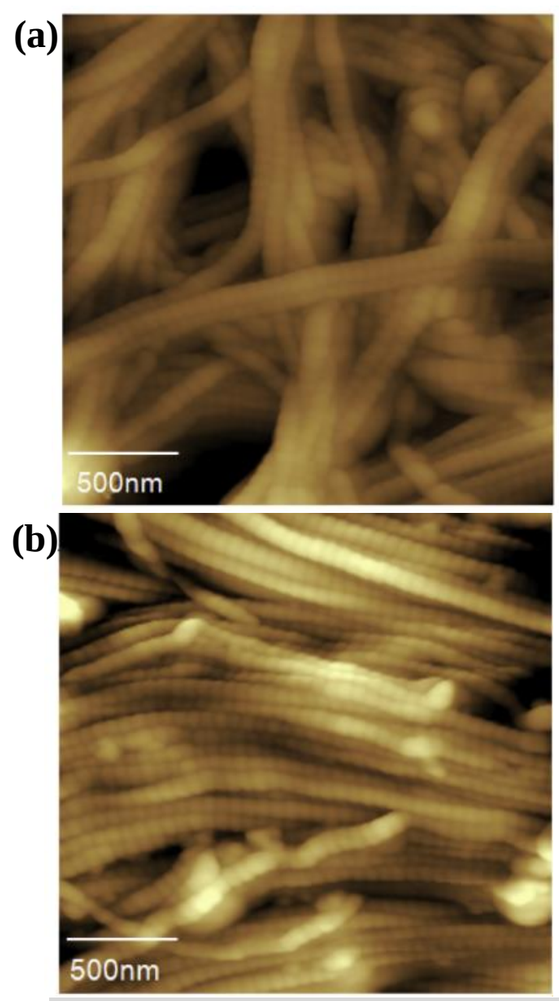

Figure 4. AFM images of fiber section of leather: non-retanned leather (a) and leather retanned with G-8-PAA (b).

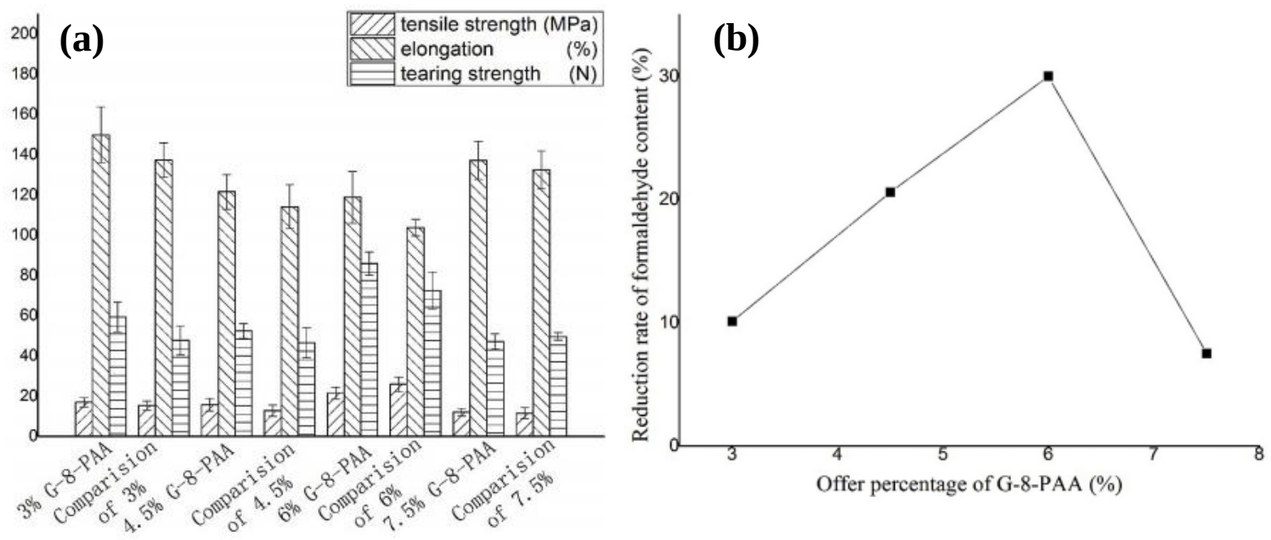

Figure 5. Mechanical properties (a) and reduction rate of formaldehyde content (b) of leathers retanned with different offer percentage of G- 8-PAA.

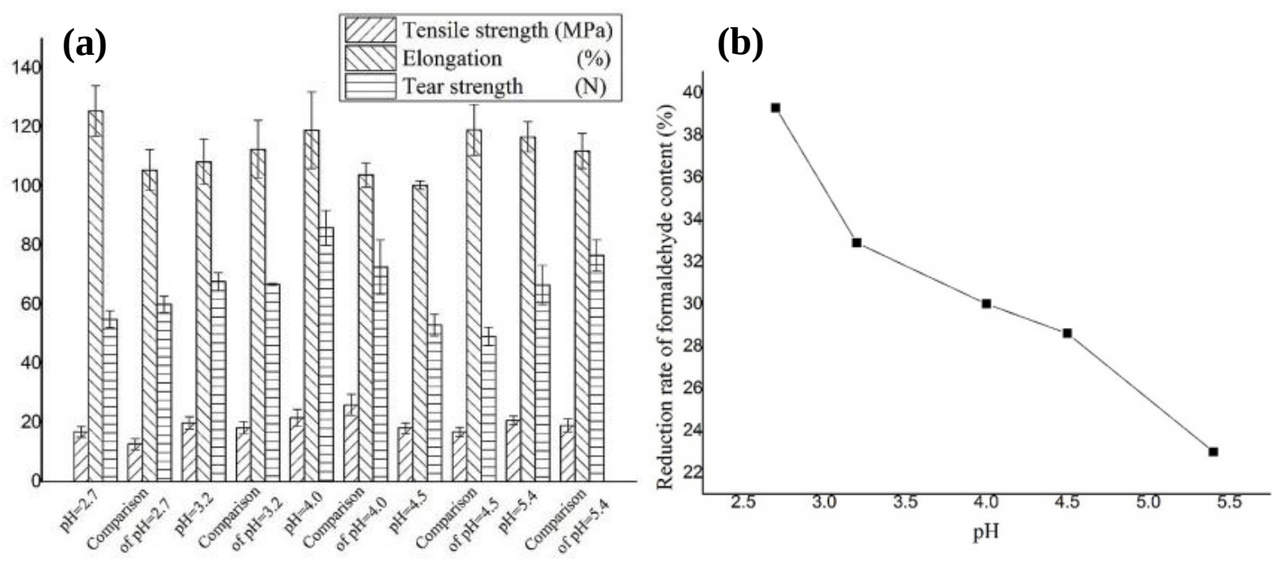

Figure 6. Mechanical properties (a) and reduction rate of formaldehyde content (b) of leathers retanned with G-8-PAA under different pH condition.

Conclusion

The results showed that the complex of PUG and PAA had good retanning performance on the aldehyde-tanned leather. The physical mechanical property of resultant leather was improved obviously, and the formaldehyde content in the resultant leather significantly decreased. And the best performance of resultant leather was found when the offer percentage of G-8-PAA complex retanning agent was 6% at lower pH condition. Therefore, this retanning system is suitable for aldehyde leather and helpful to the development of cleaner process.

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