A green clean chrome-free tanning system based on POSS-COONa and zirconium

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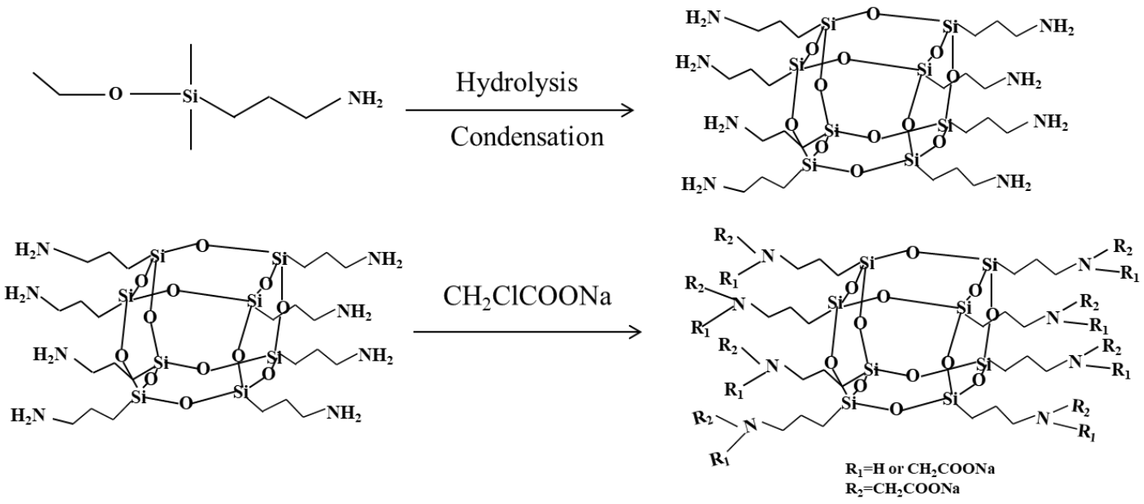
Introduction

A two-step green and clean tanning technology based on the polyhedral oligomeric silsesquioxane sodium carboxylate(POSS-COONa) and zirconium sulfate was studied to relieve the environmental pressure and resource strain caused by chrome tanning. The environmentally friendly POSS-COONa and Zr tanning method not only exhibits excellent tanning properties, but also has a promising future in clean production.

Design strategy



Results

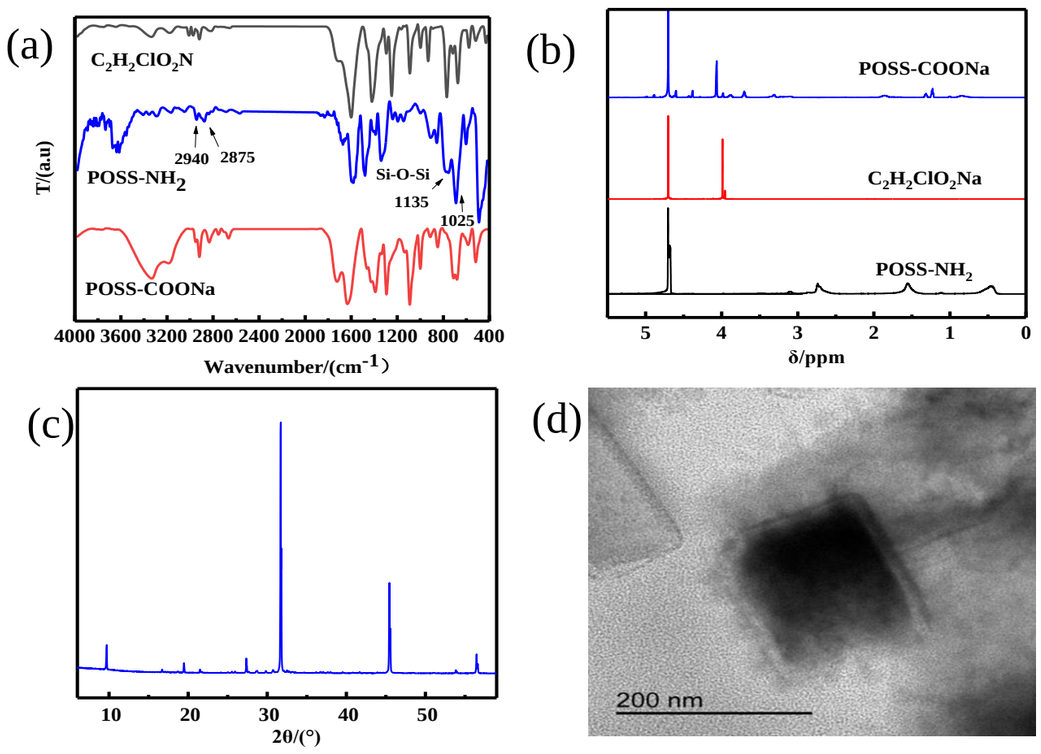


Fig. 1 FT-IR, ^{1}H-NMR, XRD and TEM images of POSS-COONa

- The POSS-COONa was prepared by amino sesquisiloxane and sodium chloroacetate as raw material.
- POSS-COONa has normal structure.

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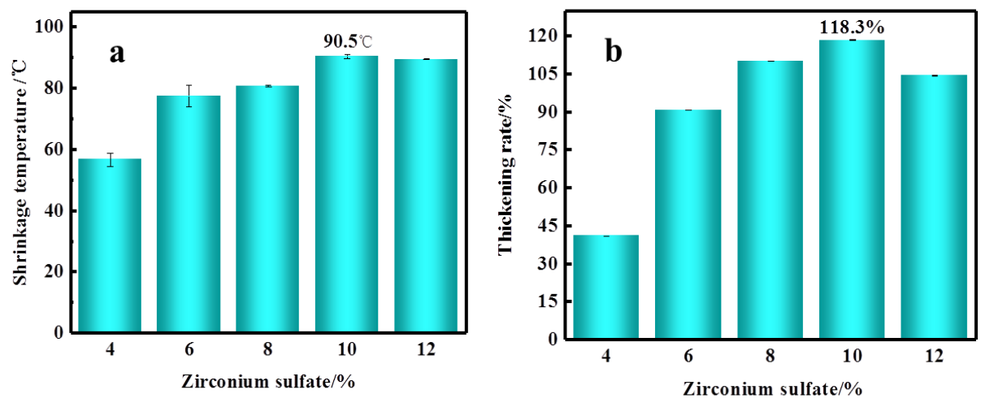

Fig.2 Shrinkage temperature (a) and thickening rate (b) of tanned leather samples with different amounts of Zirconium sulfate

- The shrinkage temperature and thickening rate increase firstly and then decrease with the increase of zirconium sulfate dosage.
- When the amount of zirconium sulfate is 10.0%, the maximum shrinkage temperature and thickening rate are 90.5 ℃ and 118.3%, respectively.

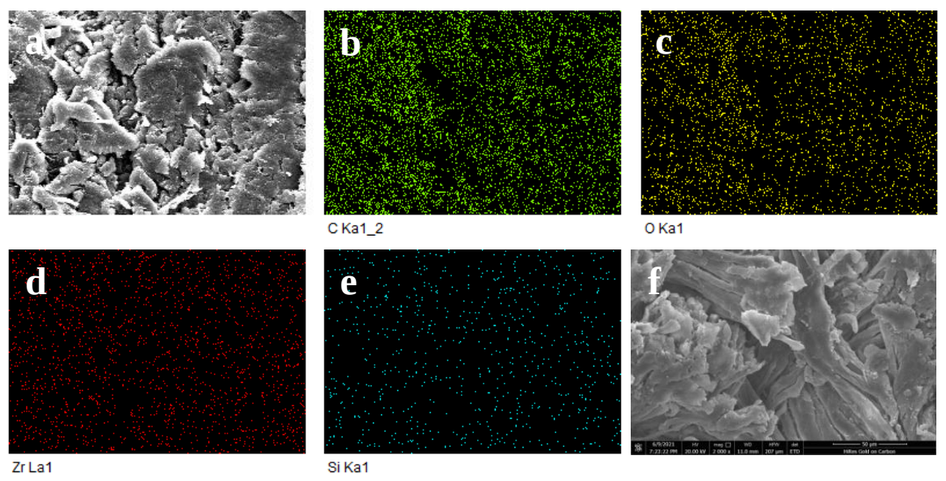

Figure 3. (a) The element plane SEM of the tanned leather of POSS-COONa and Zr; (b) C (c) O (d) Si (e) Zr (f) SEM cross section

- This region can detect C and O elements in skin collagen and characteristic elements Si and Zr elements from POSS-COONa and zirconium sulfate components.
- The above elements all show uniform dispersion. This indicates that zirconium sulfate can penetrate evenly into the skin fibrils during tanning.

Conclusions

- We prepared POSS-COONa by γ-aminopropyl triethoxy silane and sodium chloroacetate as raw material to combine with Zr tannning.
- This chrome-free tanning method result shwed the shrinkage temperature and thickening rate can reach 90.5 ℃ and 118.3%.

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