

Discarded enoki mushroom root-derived multifunctional chrome-free chitosan-based tanning agent for eco-leathers manufacturing: tanning-dyeing integration

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Introduction

The aim of this study was to develop new discarded enoki mushroom root-derived multifunctional chrome-free chitosan-based tanning agents that can be used for eco-leather manufacturing, including chrome-free tanning, tanning-dyeing integration, non-acid soaking, and non-basifying. In this study, oligochitosan (OCS) was prepared from chitosan extracted from the roots of enoki mushrooms and chemically modified using reactive dye R19 and epichlorohydrin (ECH) to prepare a biomass-based chromium-free tanning agent (OCS-R19-ECH) with both tanning and dyeing functions.

Experiment

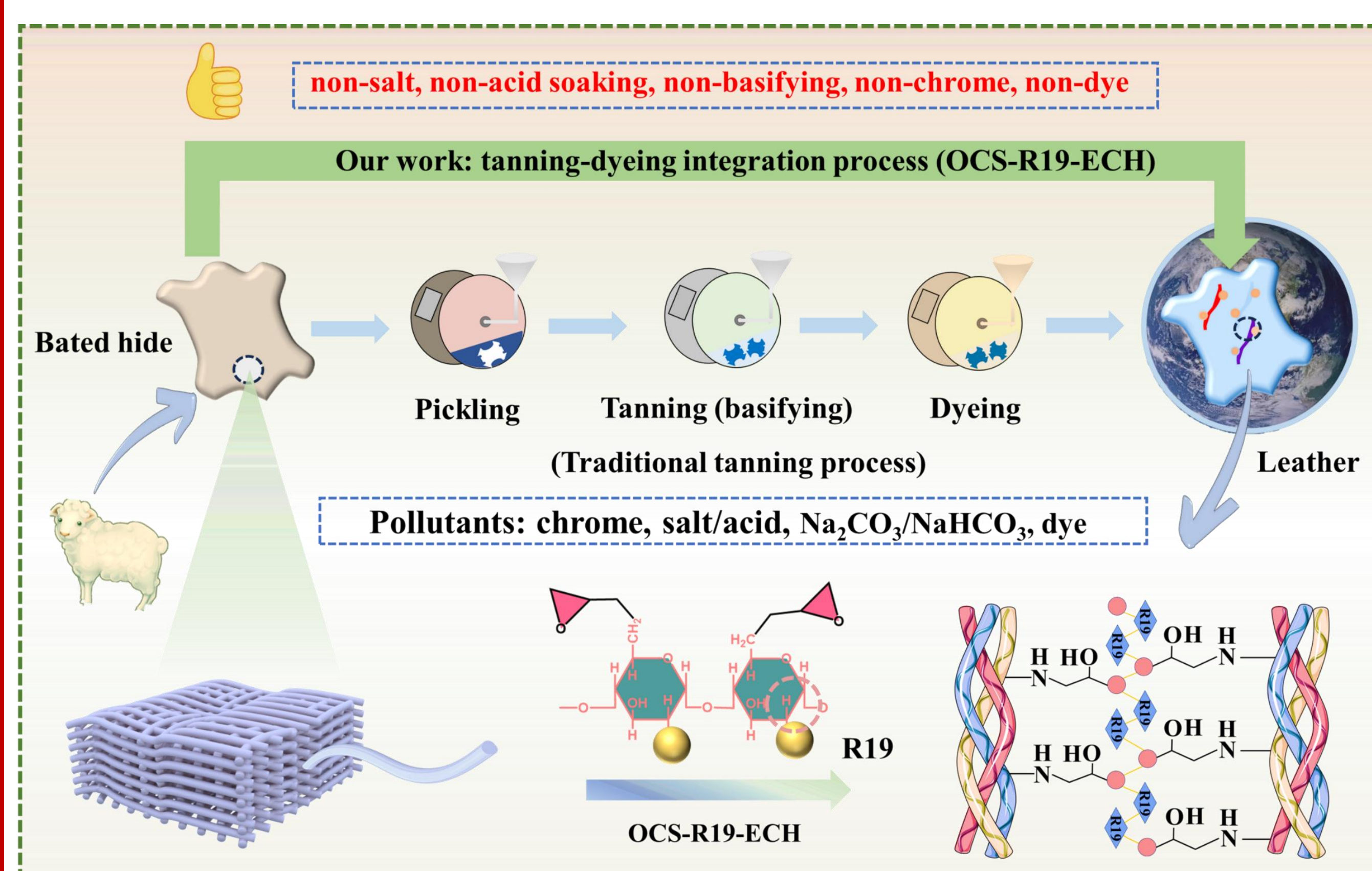


FIGURE 1 The application of OCS-R19-ECH in the tanning-dyeing integration.

Results and discussion

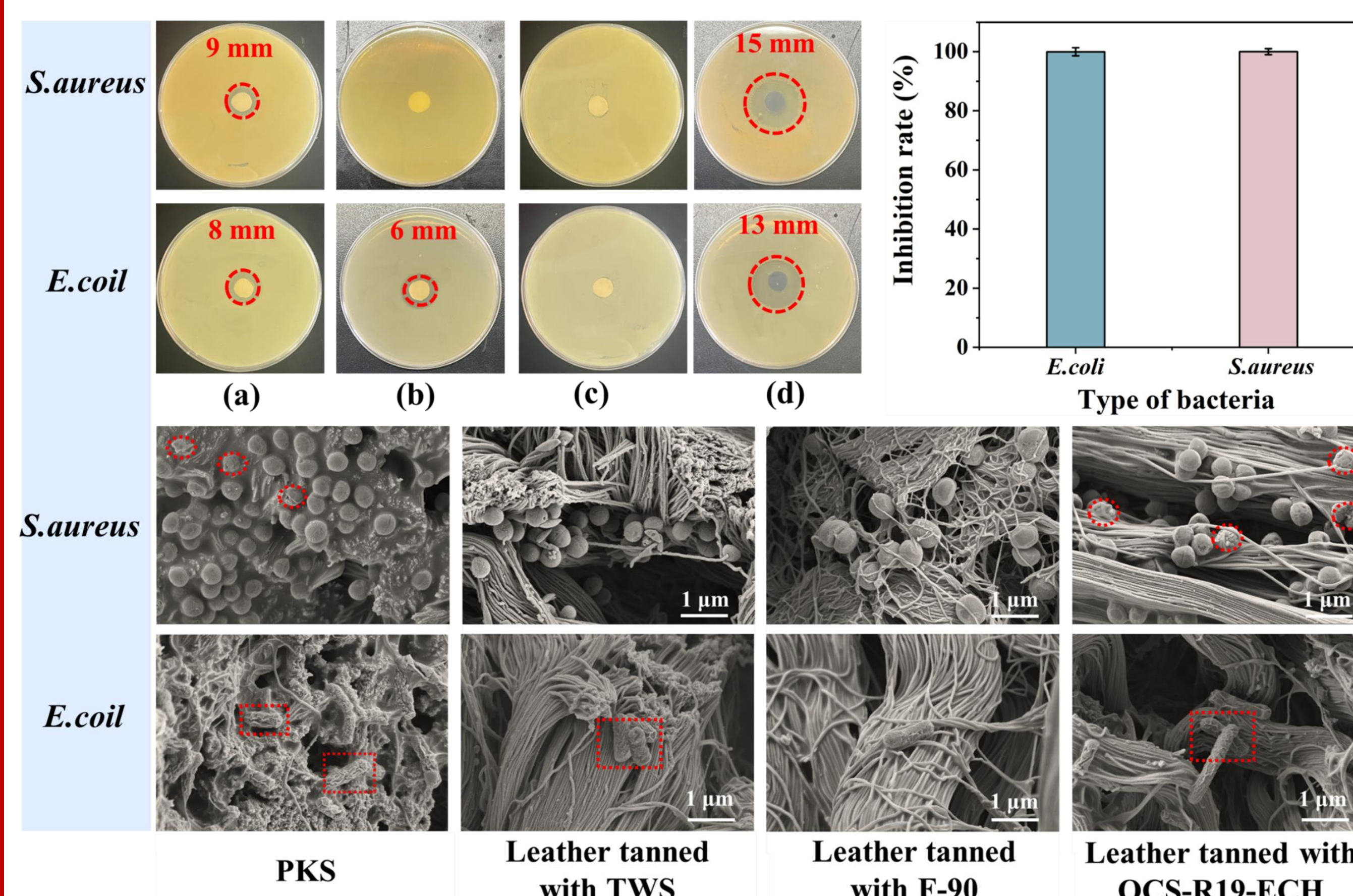


FIGURE 2 Antimicrobial performance analysis of leather.

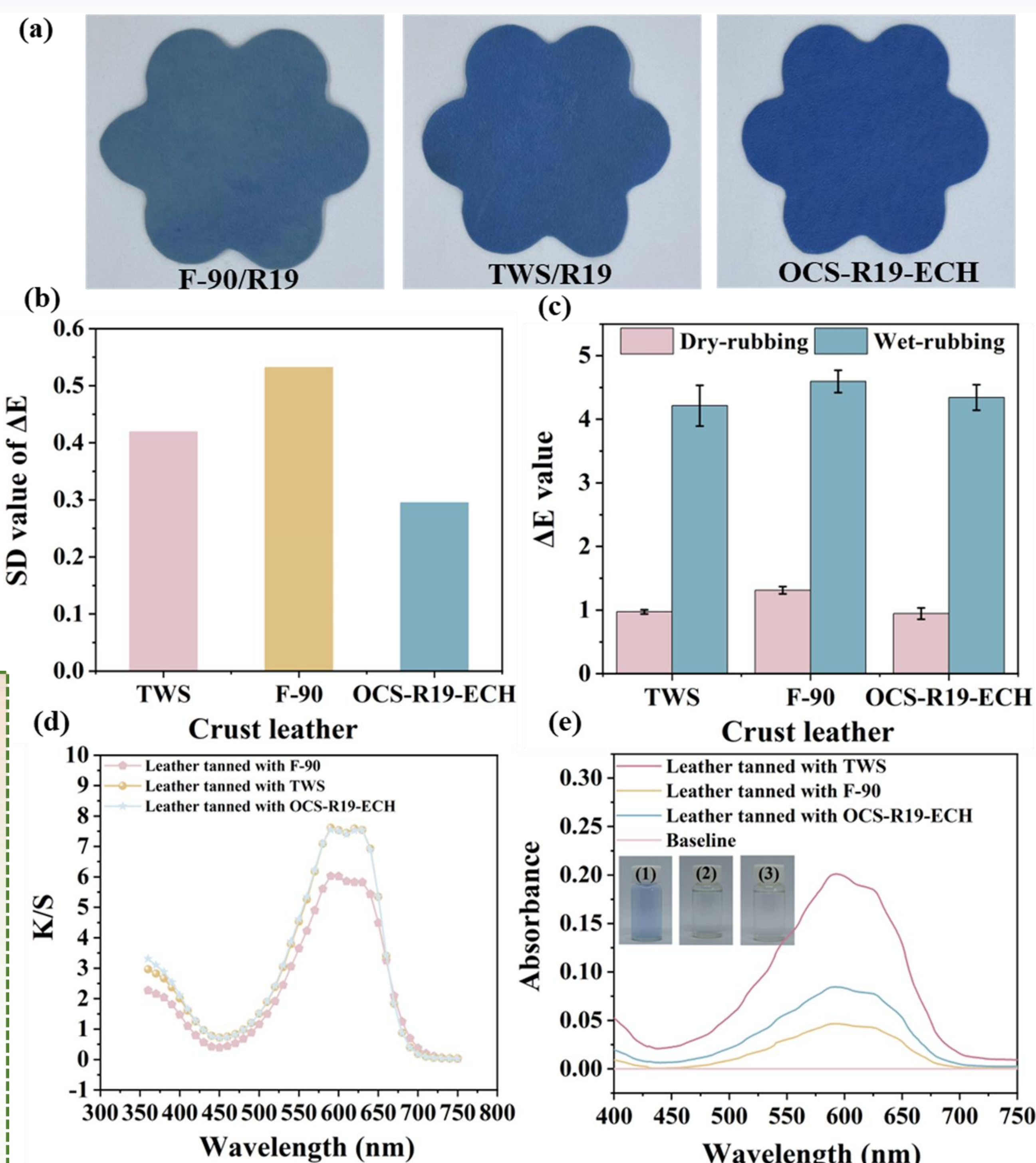


FIGURE 3 Dyeing performance

Due to the low isoelectric point of tanned leather tanned with other chroma-free tanners, the green leather can not absorb anionic dyes well, which leads to problems such as light color and easy migration of dyes. Leather tanned by OCS-R19-ECH has excellent dyeing properties. In the traditional tanning process, the combination of dyes and leather collagen mainly depends on electrostatic adsorption. For OCS-R19-ECH, the active functional group epoxy forms a covalent cross-link with the amino group of skin collagen. Therefore, the dye can be firmly attached to the leather.

Conclusion

Compared with traditional tanning materials, the OCS-R19-ECH prepared in this study not only provided excellent tanning, dyeing, and antimicrobial properties to the grey leather but also eliminated the pollution of acid, alkali, neutral salts, chromium, and toxic dyes produced in the tanning industry from the source; thus, the tanning process can be greatly reduced, and realize the cleaner production of eco-leathers manufacturing. Therefore, OCS-R19-ECH is expected to become a new functional biomass tanning agent to promote the green development of the leather industry.