

Electronic Supplementary Information

Biomass-derived aldehyde tanning agents with in-situ dyeing properties: a ‘Two Birds with One Stone’ strategy for engineering chrome-free and dye-free colored leather

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1. Post-tanning trials

The BAT-tanned leather was wrung, shaved (1.0 mm) and weighted. Then, it was filled, dyed, fatliquored according to the processes shown in Table S1. The chemical offer was based on the weight of shaved leather. The post-tanned leather was further dried and milled to obtain crust leathers. Similarly, the DAT-tanned leather was treated according to the processes shown in Table S2, and then dried and milled to obtain crust leathers.

Table S1. Post-tanning trials for BAT-tanned leather.

Process	Chemicals	Offer/%	T/°C	t/min	Remarks
Wetting	Water	100	40		
	Degreasing agent	0.5			
	Formic acid	1.0		40	pH=6.0±, Drain
Retanning, Filling and Dyeing	Water	100	35		
	Acrylic resin	3.0			
	Dispersing syntan	1.0		30	
	Amine resin	2.5			
	Leather dye	2.0		30	SD/CD
	Dispersing syntan	1.0			
	Wattle extract	4.0		60	
Formic acid	0.5×n		15×n	pH=4.0±	
			30	Drain	

	Water	150	50		
	Protein filling agent	1.0		10	
Fatliquoring	Synthetic fatliquor	4.0			
	Compounded fatliquor	4.0			
	Formic acid	0.5×n		15×n	pH=3.6-3.8
				30	Drain
Washing	Water	400×3	RT	10×3	Drain

Table S2. Post-tanning trials for DAT-tanned leather.

Process	Chemicals	Offer/%	T/°C	t/min	Remarks
	Water	100	40		
Wetting	Degreasing agent	0.5			
	Formic acid	1.0		40	pH=6.0±, Drain
	Water	100	35		
	Acrylic resin	3.0			
Retanning and Filling	Dispersing syntan	1.0		30	
	Amine resin	2.5			
	Formic acid	0.5×n		15×n	pH=4.0±
				30	Drain

	Water	150	50		
	Protein filling agent	1.0		10	
Fatliquoring	Synthetic fatliquor	4.0			
	Compounded fatliquor	4.0			
	Formic acid	0.5×n		15×n	pH=3.6-3.8
				30	Drain
Washing	Water	400×3	RT	10×3	Drain