

Supporting Information

Cyclic carbonate: a recyclable medium for zero discharge tanning

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Supplementary Table S1. Process recipe for the conversion of goat limed pelts into tanned leather by conventional aqueous based chrome tanning process

Process/Chemicals	% Offer	Time	Remarks
<i>Washing</i>			
Water	100	10 min	Drain completely
<i>Deliming</i>			
Ammonium chloride	2	1 h	Completion was checked by phenolphthalein indicator
<i>Bating</i>			
Microbate-R	0.75	1 h	Completion was checked by air bubble test and washed thoroughly
<i>Pickling</i>			
Water	100		
Sodium chloride	10	15 min	
Formic acid	1		
Water	10	2x5+30 min	
Sulfuric acid	1		
Water	10	3x10+30 min	pH adjusted to 2.8-3.0;
<i>Chrome tanning</i>			
BCS	8	2x30 +1 h	Cross section was checked for penetration
Preservative	0.3		
Water	50	15 min	
<i>Basification</i>			
Sodium formate	1		
Water	10	30 min	
Sodium bicarbonate	1		Check pH 3.8-4.0 Drain: aged for 24 h
Water	10	4x10 min + 1 h	
Note: The same process recipe is followed for the subsequent batches of tanning.			

Supplementary Table S2. Process recipe for the conversion of goat limed pelts into tanned leather by cyclic carbonate based chrome tanning process (Batch-1)

Process/Chemicals	% Offer	Time	Remarks
<i>Washing</i>			
Water	100	10 min	Drain completely
<i>Deliming</i>			
Ammonium chloride	2	1 h	Completion was checked by phenolphthalein indicator
<i>Bating</i>			
Microbate-R	0.75	1 h	Completion was checked by air bubble test and washed thoroughly
<i>Pickling</i>			
Water	100		
Sodium chloride	10	15 min	
Formic acid	1		
Water	10	2x5+30 min	
Sulfuric acid	1		pH adjusted to 2.8-3.0; Pickle liquor drained
Water	10	3x10+30 min	completely
<i>Chrome tanning</i>			
BCS	5	2x30 +1 h	Cross section was checked for penetration
Propylene carbonate	25		
<i>Basification</i>			
Sodium formate	0.5	30 min	
Sodium bicarbonate	0.8		
Propylene carbonate	3	4x10 min + 1 h	Check pH 3.8-4.0 aged for 24 h. Used propylene carbonate drained and collected separately

Supplementary Table S3. Process recipe for the conversion of goat limed pelts into tanned leather by cyclic carbonate based chrome tanning process (Batch-2)

Process/Chemicals	% Offer	Time	Remarks
<i>Washing</i>			
Water	100	10 min	Drain completely
<i>Deliming</i>			
Ammonium chloride	2	1 h	Completion was checked by phenolphthalein indicator
<i>Bating</i>			
Microbate-R	0.75	1 h	Completion was checked by air bubble test and washed thoroughly
<i>Pickling</i>			
Used pickle liquor from batch 1			
Water	10		
Sodium chloride	2	15 min	
Formic acid	0.2		
Water	5	2x5+30 min	
Sulfuric acid	0.5		pH adjusted to 2.8-3.0; Pickle liquor
Water	10	3x10+30 min	drained completely
<i>Chrome tanning</i>			
BCS	5	2x30 +1 h	Cross section was checked for penetration
Used Propylene carbonate from batch 1			
Fresh Propylene carbonate	10		
<i>Basification</i>			
Sodium formate	0.5	30 min	Check pH 3.8-4.0: aged for 24 h. Used
Sodium bicarbonate	0.8	4x10 min + 1 h	propylene carbonate drained and
Propylene carbonate	3		collected separately.