

Supporting information

Table S1. Recipe for lubrication of leather with oil dispersions

Process	Chemical offer (% w/w of leather)	Time (min)	Condition/ Remarks
Washing	Water (100%)	5	Same as practiced commercially
Neutralization	Water (100%) Sodium formate (1%) Sodium bicarbonate (1.5%)	10 split into 3 equal feeds at 5 min interval followed by 30 min	Same as practiced commercially pH at cross-section – 5.0 – 5.5
Washing	Water (100%)	5	Same as practiced commercially
Fatliquoring	Solvent / solvent mixture (200%) Oil – solvent dispersion (10%)	45	Modified to suit this work. Conventional process uses 100-200% water and commercial fatliquor (sulfited/sulfonated etc. oils with emulsifiers)
Fixing	Formic acid (1%)	split into 3 equal feeds at 5 min interval followed by 30 min	Same as practiced commercially pH 3.8-4.0

Characterization of oils. The oils used for the present study were evaluated for acid value and saponification values, determined as per standard procedure.¹ The measurements were performed in triplicate. The results were reproducible within limits of experimental error and the average of the results reported.

Table S2. Acid value and saponification value for CO, CSO and FO employed in this study

oil	Acid value (mg KOH/g)	Saponification value (mg KOH/g)
CO	2	183
CSO	1.7	197
FO	44	210

Table S3. Kinematic viscosity (ν), cSt of CO, CSO and FO in different solvents, Temp., 25 °C

CO	Kinematic viscosity (ν), cSt		CSO	Kinematic viscosity (ν), cSt		FO	Kinematic viscosity (ν), cSt	
Solvent volume fraction (ϕ_s)	CO-IPA	CO-H:EA (9:1)	Solvent volume fraction (ϕ_s)	CSO-Hep	CSO-H:IPA (1:9)	Solvent volume fraction (ϕ_s)	FO-IPA	FO-EA
0.95106	3.492	0.730	0.949	0.705	2.366	0.955	3.567	0.696
0.90668	4.2001	0.902	0.903	0.821	2.695	0.914	4.518	0.906
0.76408	8.052	2.469	0.756	1.501	4.282	0.781	9.362	2.516
0.66024	13.455	4.976	0.651	2.316	6.130	0.682	13.959	4.139
0.54844	22.391	10.288	0.538	3.844	8.922	0.573	20.960	6.5449

Table S4. Viscosity values for neat solvents and their mixtures employed in this study

Solvent/Solvent mixture	Viscosity (cPs)
	@ 20°C
EA	0.45
Hep	0.42
IPA	2.4
Hep:EA (0.1:0.9)	0.47
Hep:EA (0.9: 0.1)	0.42
Hep:IPA (0.9:0.1)	0.54
Hep:IPA (0.1:0.9)	1.7

REFERENCES

1. I.S.I, *Handbook of Food Analysis*. 17th ed.; 1984.