

Electronic Supplementary Information

Valorization of chicken feathers using aqueous solutions of ionic liquids

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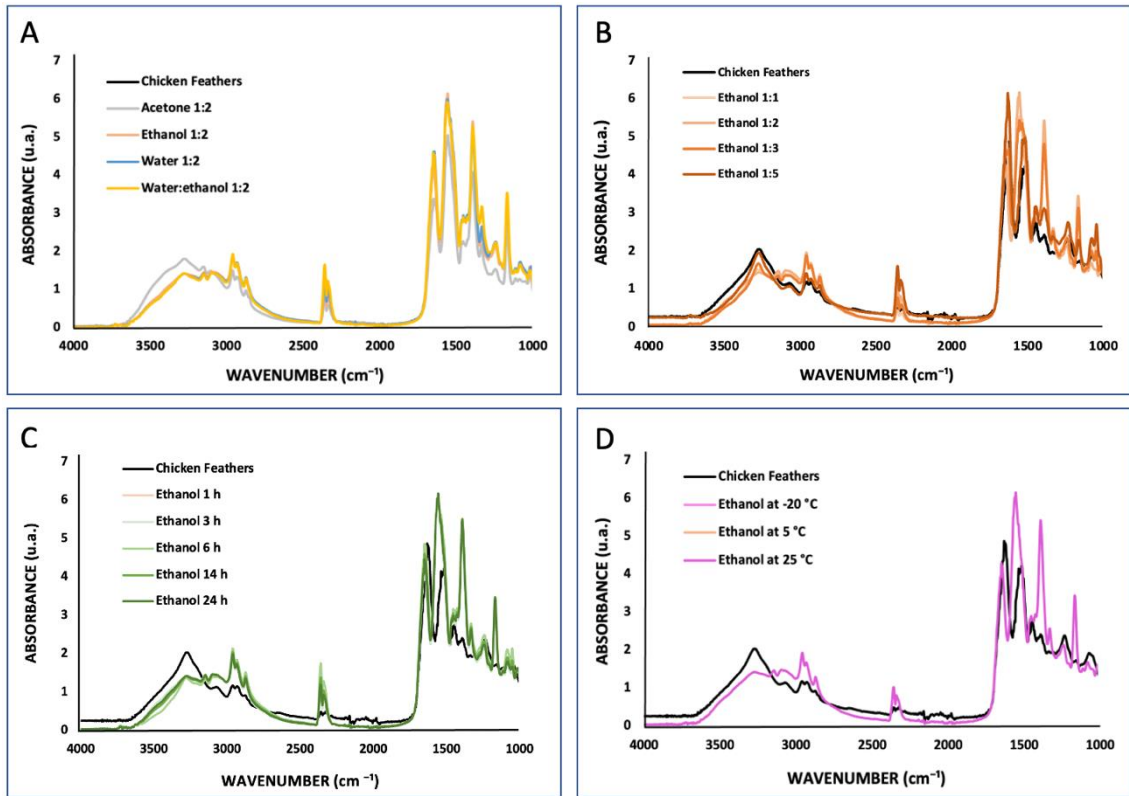


Fig. S1 FTIR spectra of chicken feathers and keratin samples recovered using different conditions: acetone 1:2 (1:2 w/w, 1 h, 5 °C), ethanol 1:2 (1:2 w/w, 1 h, 5 °C), water 1:2 (1:2 w/w, 1 h, 5 °C), water:ethanol 1:2 (1:2 w/w, 1 h, 5 °C) (**A**); ethanol 1:1 (1:1 w/w, 1 h, 5 °C), ethanol 1:2 (1:2 w/w, 1 h, 5 °C), ethanol 1:3 (1:3 w/w, 1 h, 5 °C), ethanol 1:5 (1:5 w/w, 1 h, 5 °C) (**B**); ethanol 1 h (1:2 w/w, 1 h, 5 °C) ethanol 3 h (1:2 w/w, 3 h, 5 °C), ethanol 6 h (1:2 w/w, 6 h, 5 °C), ethanol 14 h (1:2 w/w, 14 h, 5 °C), ethanol 24 h (1:2 w/w, 24 h, 5 °C) (**C**); ethanol -20 °C (1:2 w/w, 1 h, -20 °C), ethanol 5 °C (1:2 w/w, 1 h, 5 °C), ethanol 25 °C (1:2 w/w, 1 h, 25 °C) (**D**).

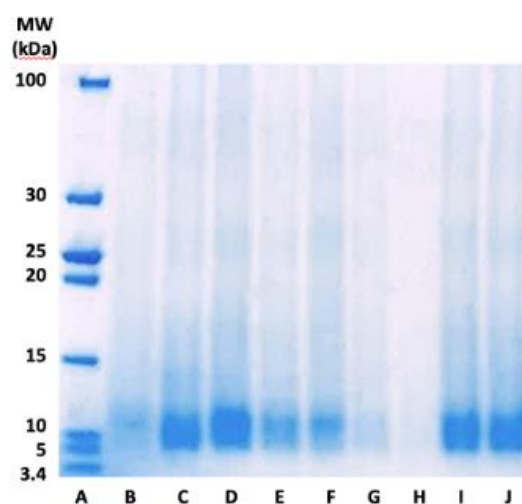


Fig. S2 SDS-PAGE of protein marker (A) and keratin samples recovered using different conditions: ethanol (1:1 w/w, 1 h, 5 °C) (B), ethanol (1:2 w/w, 1 h, 5 °C) (C), ethanol (1:3 w/w, 1 h, 5 °C) (D), ethanol (1:5 w/w, 1 h, 5 °C) (E), water (1:2 w/w, 1 h, 5 °C) (F), water: ethanol (1:2 w/w, 1 h, 5 °C) (G), acetone (1:2 w/w, 1 h, 5 °C) (H), ethanol (1:2 w/w, 1 h, -20 °C) (I) and ethanol (1:2 w/w, 1 h, 25 °C) (J).

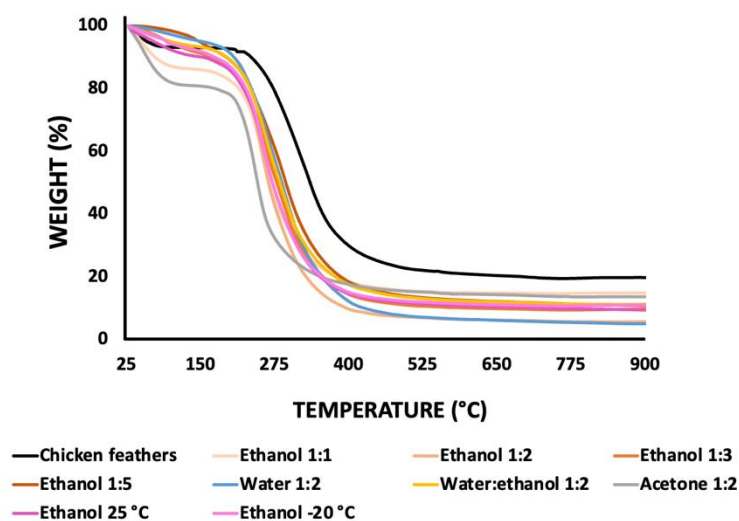


Fig. S3 TGA curves of the keratin samples using different recovery conditions.

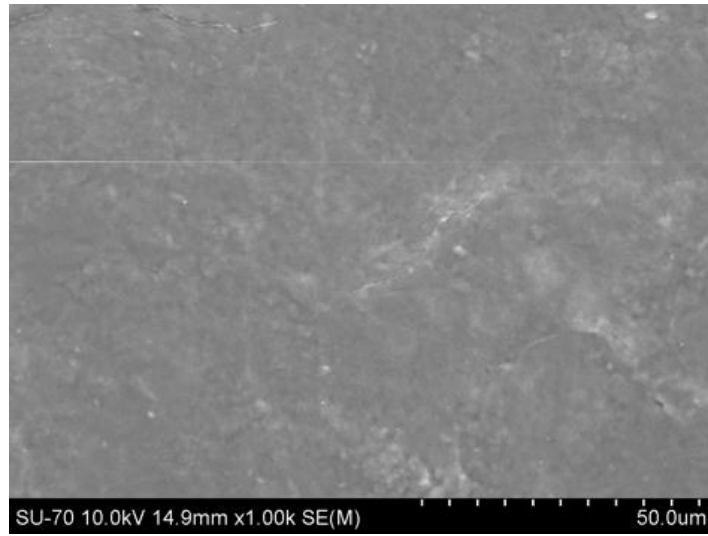


Fig. S4 SEM image of the produced keratin film.

NMR spectra of 1-butyl-3-methylimidazolium acetate ([C₄C₁im][C₁CO₂])

[C₄C₁im][C₁CO₂] *fresh*:

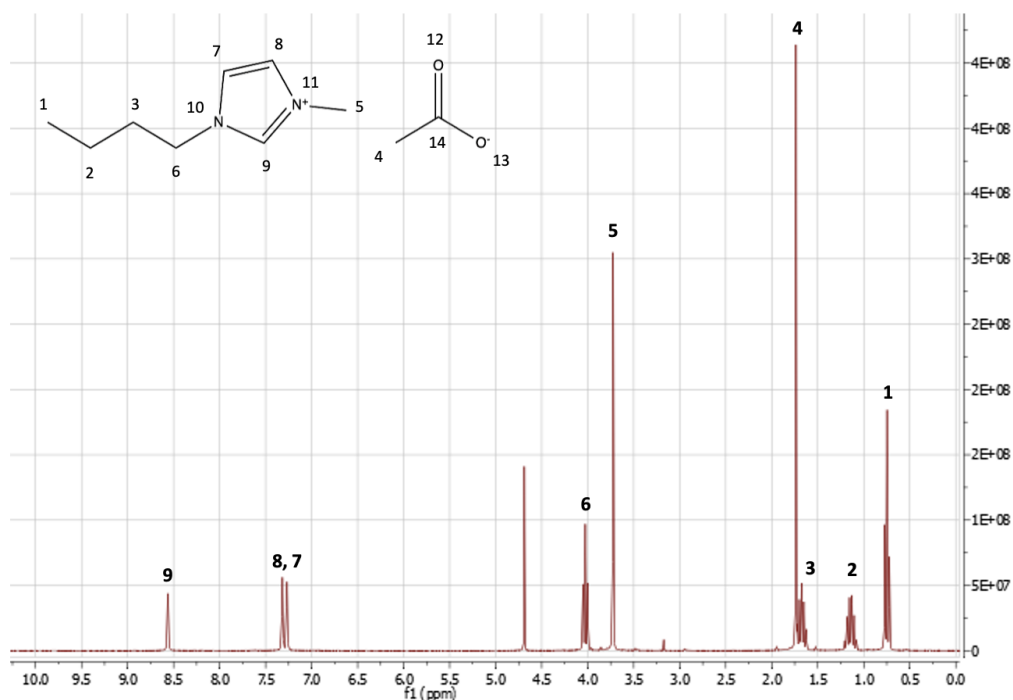


Fig. S5 1-butyl-3-methylimidazolium acetate, [C₄C₁im][C₁CO₂], ¹H NMR (D₂O, 300 MHz, [ppm]): 8.56 (1H, s); 7.32 (1H, s); 7.26 (1H, s); 4.02 (2H, t, J= 14.4 Hz); 3.72 (3H, s); 1.78 (3H, s); 1.68 (2H, m); 1.16 (2H, m); 0.75 (3H, t, J=14.7 Hz).

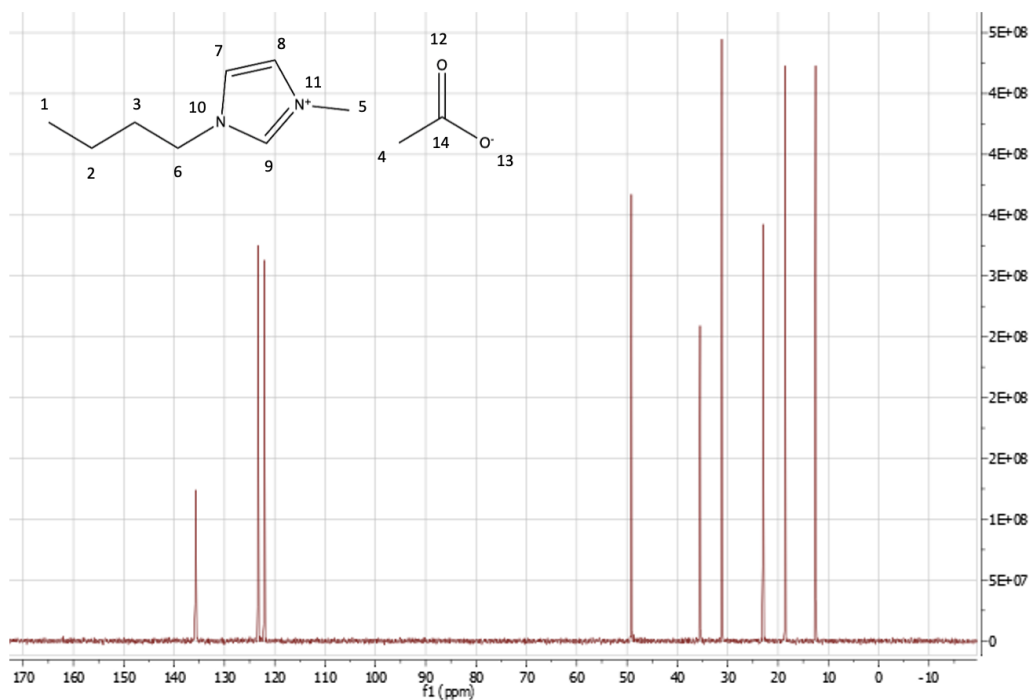


Fig. S6 ¹³C NMR (D₂O, 75.47 MHz, [ppm]): 135.74; 123.67; 122.09; 49.14; 35.49; 31.15; 23.02; 18.50; 12.53.

[C₄C₁im][C₁CO₂] recovered:

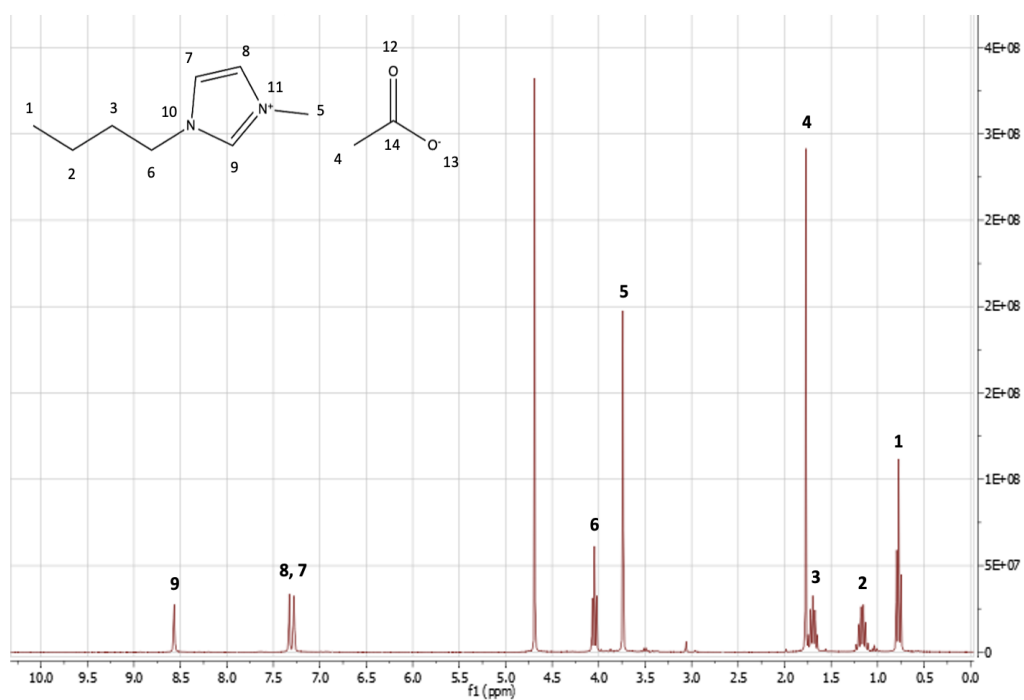


Fig. S7 Recycled 1-butyl-3-methylimidazolium acetate, *[C₄C₁im][C₁CO₂]*, ¹H NMR (D₂O, 300 MHz, [ppm]): 8.57 (1H, s); 7.33 (1H, s); 7.28 (1H, s); 4.05 (2H, t, J=14.4 Hz); 3.74 (3H, s); 1.77 (3H, s); 1.69 (2H, m); 1.15 (2H, m); 0.77 (3H, t, J = 15 Hz).

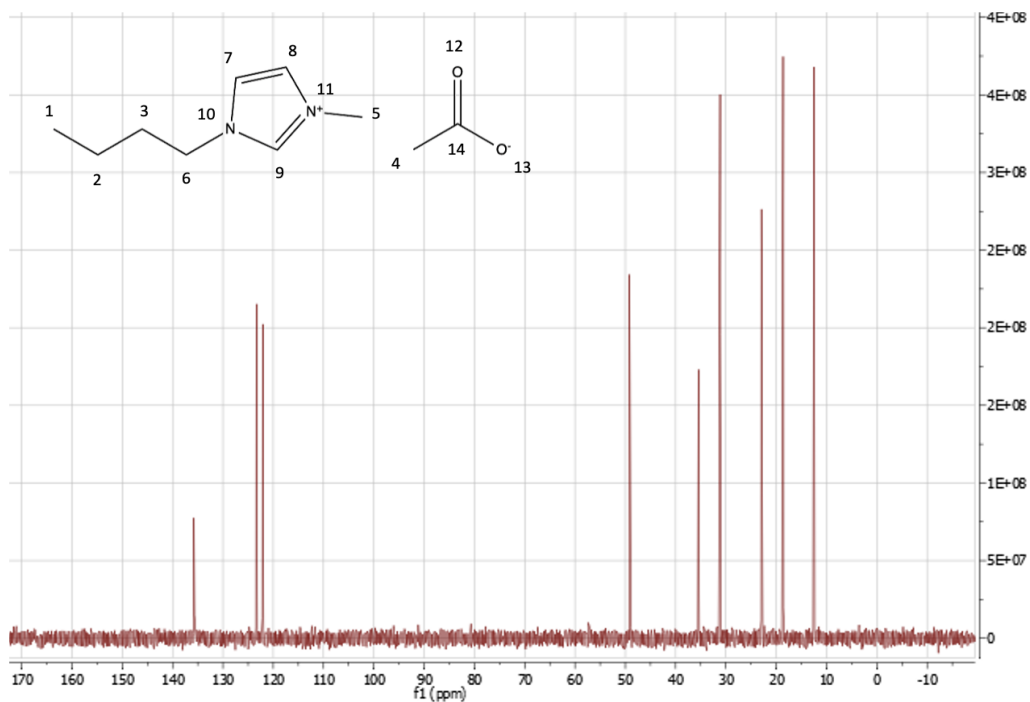


Fig. S8 ¹³C NMR (D₂O, 75.47 MHz, [ppm]): 135.65; 123.35; 121.87; 49.16; 35.48; 31.16; 23.07; 18.49; 12.51.

References

- [1] O. L. Shanmugasundaram, K. Syed Zameer Ahmed, K. Sujatha, P. Ponnmurugan, A. Srivastava, R. Ramesh, R. Sukumar and K. Elanithi, Fabrication and characterization of chicken feather keratin/polysaccharidesblended polymer-coated nonwoven dressing materials for wound healing applications, *Materials Science & Engineering C*, 2018, 92, 26–33.
- [2] A. Idris, R. Vijayaraghavan, U. A. Rana, D. Fredericks, A. F. Patti and D. R. MacFarlane, Dissolution of feather keratin in ionic liquids, *Green Chemistry*, 2013, 15, 525–534.