Supporting information

Upcycling of textile waste into high added value cellulose porous materials, aerogels and cryogels

Marion Négrier[1], Elise El Ahmar[2], Romain Sescousse[3], Martial Sauceau[3], Tatiana Budtova[1]*

[1]Mines Paris, PSL University, Center for Materials Forming (CEMEF), UMR CNRS 7635, CS 10207, 06904 Sophia Antipolis, France

[2]Mines Paris, PSL University, Centre for Thermodynamics of Processes (CTP), 77300 Fontainebleau, France

[3] Centre RAPSODEE, UMR *CNRS* 5302, IMT Mines Albi, Université de Toulouse, France

Corresponding author: Tatiana Budtova, tatiana.budtova@minesparis.psl.eu

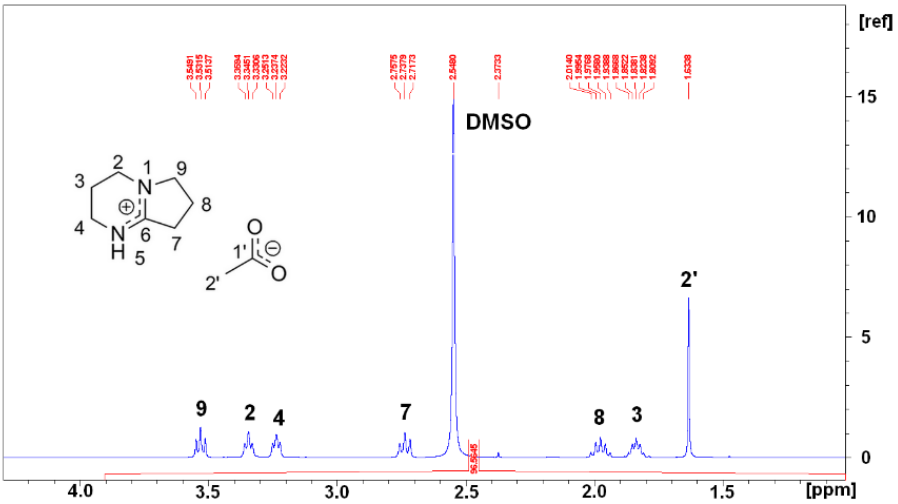

Figure S1.

^{1}H NMR in d_6-DMSO of [DBNH][OAc]

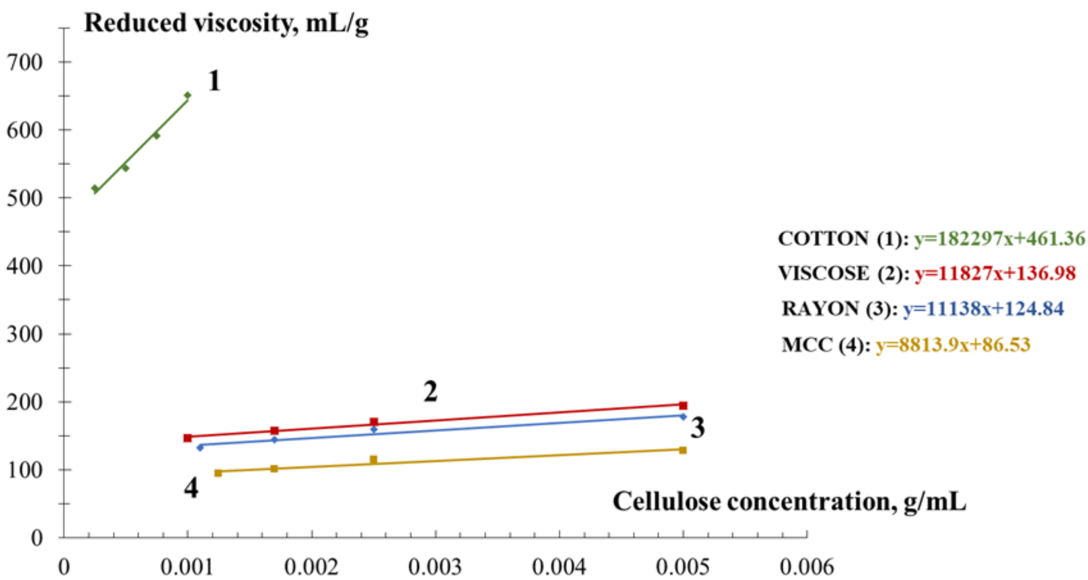

Figure S2.

Reduced viscosity of cotton (1), viscose (2), rayon (3) and MCC (4) as a function of cellulose concentration.

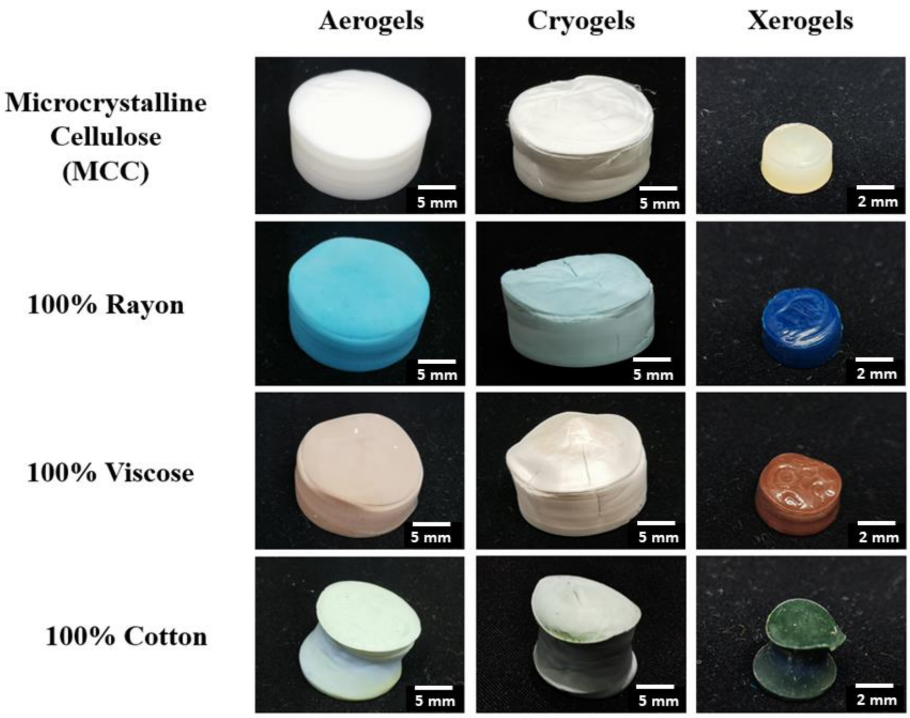

Figure S3.
Photos of cellulose aerogels, cryogels and xerogels from MCC and cellulose from textiles. The solvent was [EMIM][OAc]/DMSO and cellulose was coagulated using Method 1.

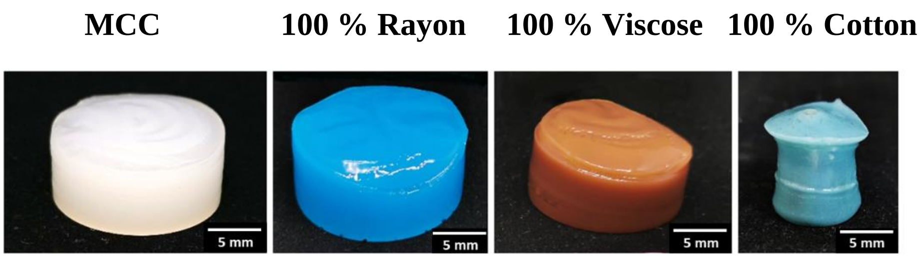

Figure S4.
Alcogels of cellulose dissolved in [EMIM][OAc], coagulation Method 1.

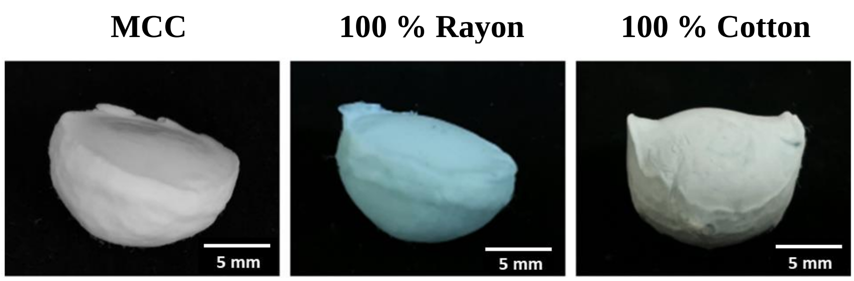

Figure S5.
Photos of aerogels from MCC, rayon and cotton. The solvent was [DBNH][OAc]/DMSO and cellulose was coagulated using Method 2.

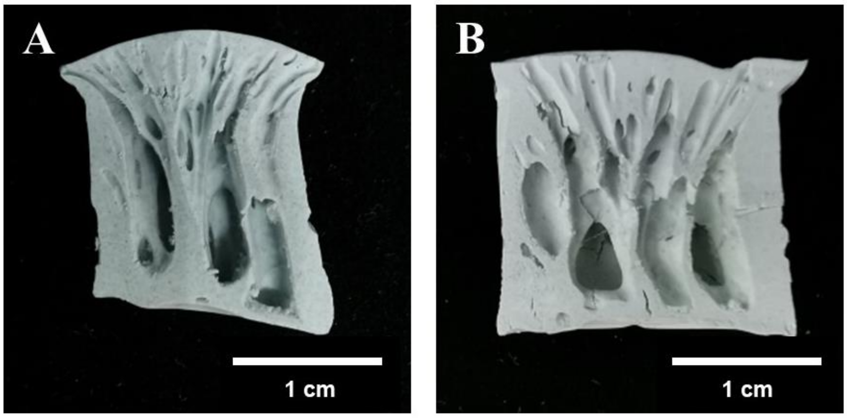

Figure S6
Morphology of aerogel (A) and cryogel (B) from cotton dissolved in [DBNH][OAc]/DMSO and coagulated using Method 1.

Table S1. Dispersion δ_d, polar δ_p, hydrogen bonding δ_h and total δ_{total} solubility parameters of cellulose. δ_d, δ_p and δ_h are taken from (Barton, 1991), $\delta_{total} = ({\delta_d}^2 + {\delta_p}^2 + {\delta_h}^2)^{1/2}$

δ_d, MPa$^{0.5}$	δ_p, MPa$^{0.5}$	δ_h, MPa$^{0.5}$	δ_{total}, MPa$^{0.5}$
24.3	19.9	22.5	38.6

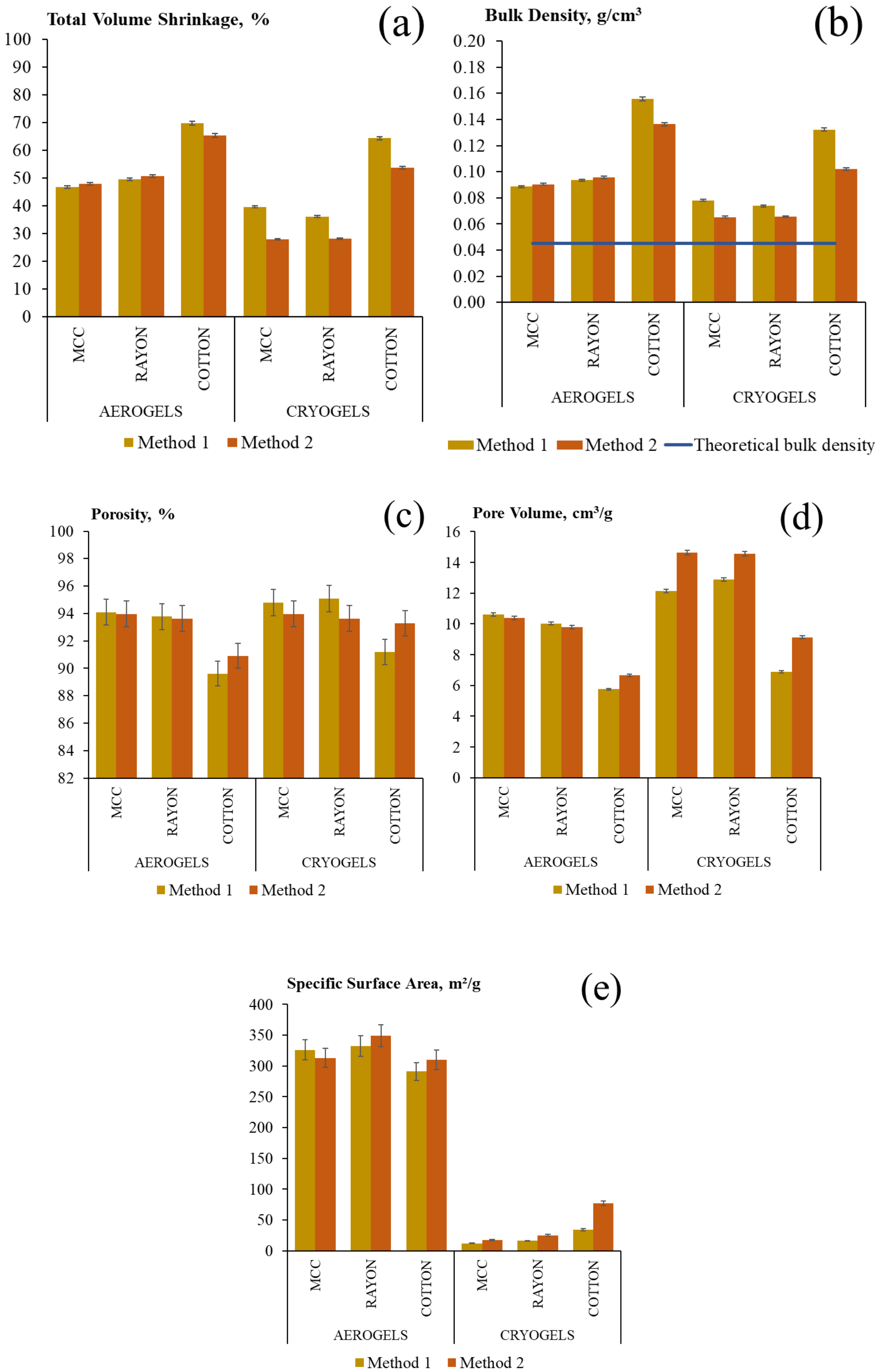

Figure S7.
Volume shrinkage (a), density (b), porosity (c), pore volume (d) and specific surface area of aerogels and cryogels made by cellulose dissolution in [DBNH][OAc]/DMSO

and coagulated using Method 1 (direct coagulation) or Method 2 (delayed demixing using Soxhlet extraction thimbles). Volume and density were measured with Geopyc.

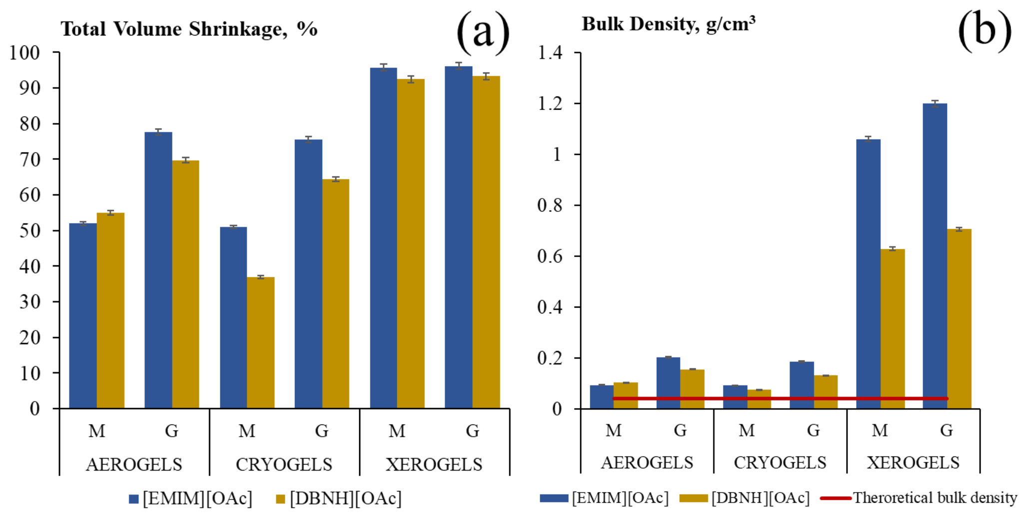

Figure S8.
Volume shrinkage (a) and density (b) of aerogels, cryogels and xerogels obtained by cotton dissolution in [EMIM][OAc]/DMSO or in [DBNH][OAc]/DMSO, coagulated using Method 1 and measured either manually (M) or with Geopyc (G). Red line in (b) shows theoretical density calculated supposing no shrinkage

Aerogels ***Cryogels***

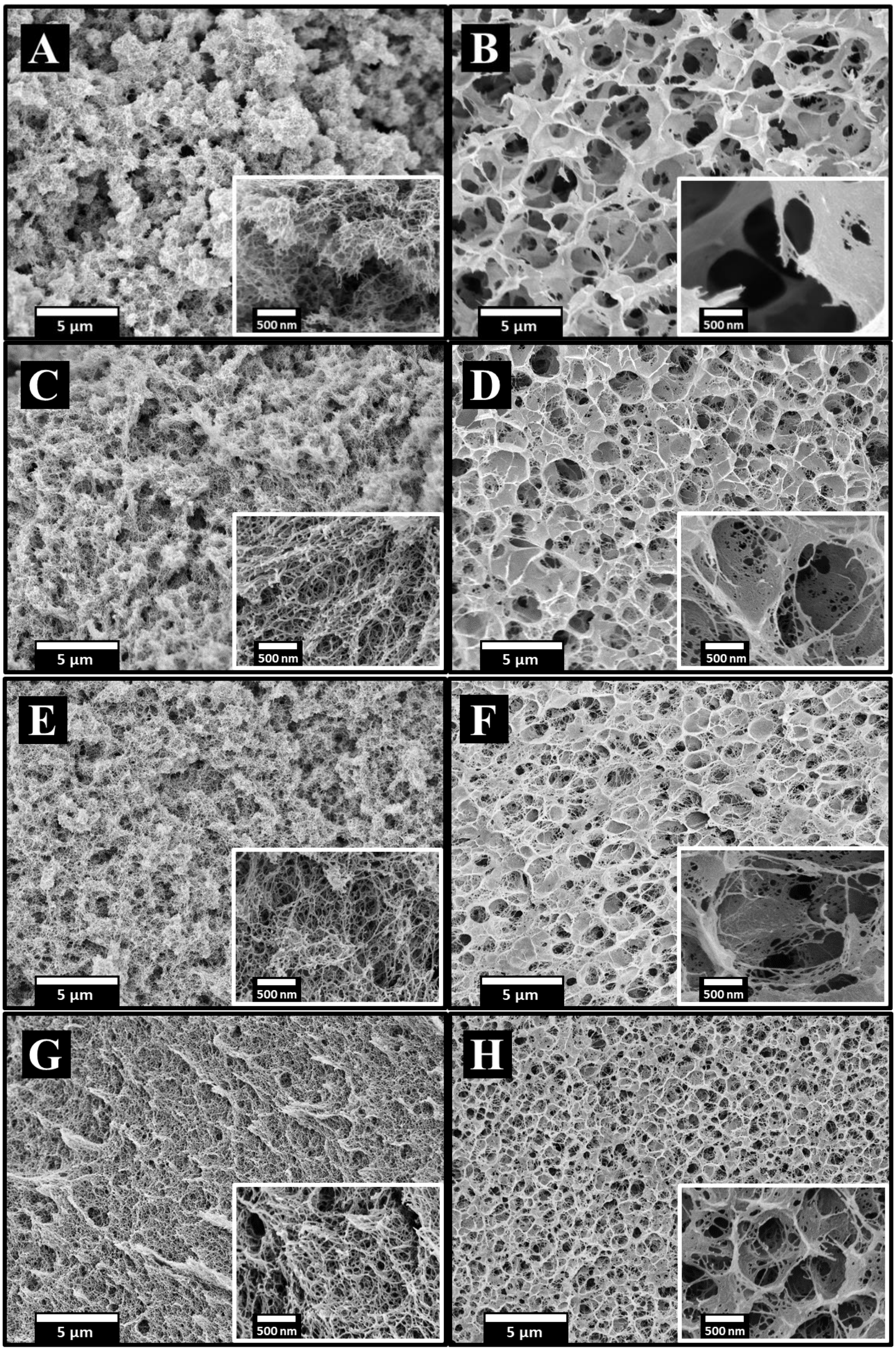

Figure S9.
Morphology of aerogels (A, C, E and G) and cryogels (B, D, F and H) from MCC (A, B), rayon (C, D), viscose (E, F) and cotton (G, H) made using [EMIM][OAc]/DMSO and coagulation Method 1. The small scale does not allow the observation of macrovoids in cotton sample.

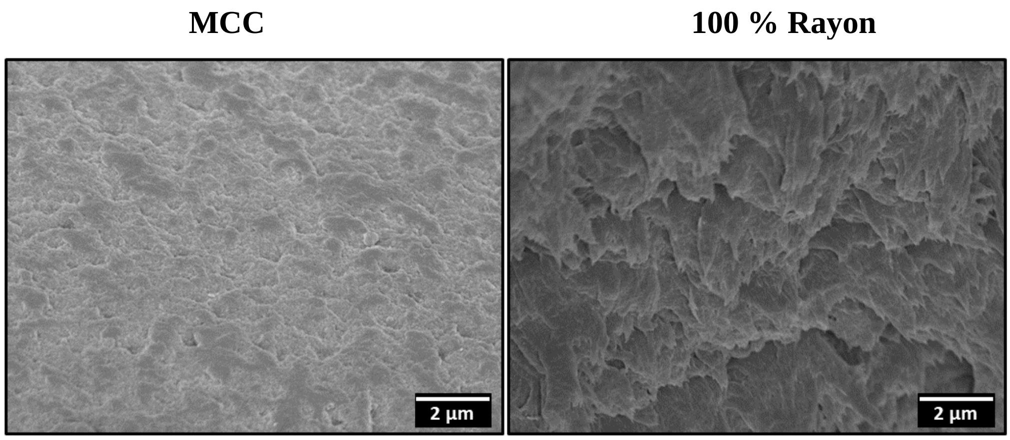

Figure S10.
Morphology of xerogels made from MCC and rayon dissolved in [EMIM][OAc]/DMSO using coagulation Method 1.

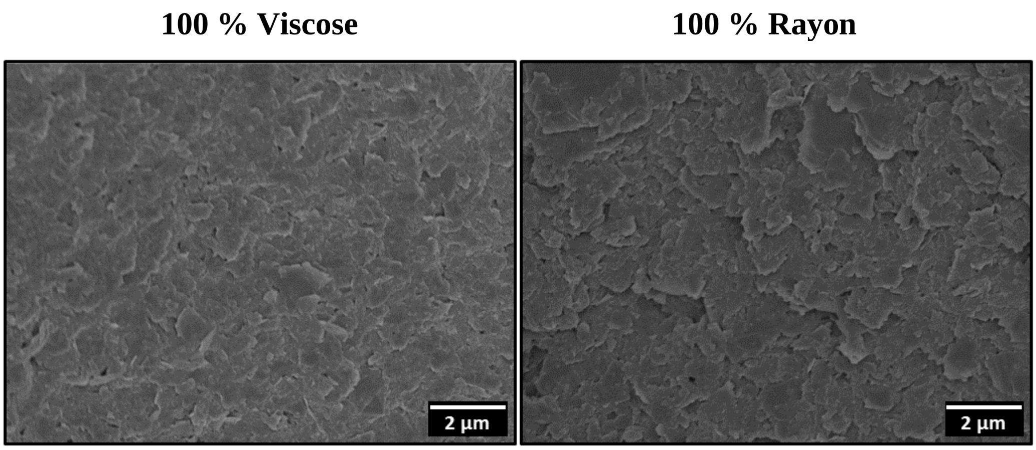

Figure S11.
Morphology of xerogels made of textile dissolved in [DBNH][OAc]/DMSO using coagulation Method 1.

References

Barton, A. F. M. (1991). *Handbook of Solubility Parameters and Other Cohesion Parameters*. CRC Press.