

Spontaneous exfoliation of a drying gel

Electronic Supplementary Information

Supplementary Figures:



Drying time →

Fig. S1 Cracking and subsequent peeling of a dried layer from an edge. Note that this appears to be a rather rare case and our results from multiple experiments suggest that cracks initiate at seemingly random locations.

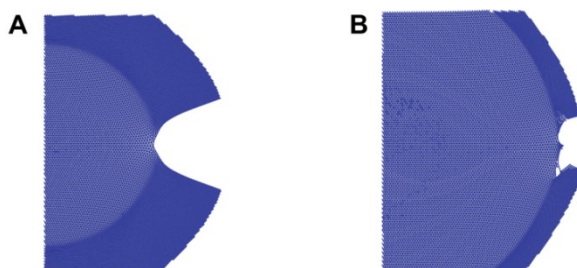


Fig. S2 Numerical simulations of circular elastic networks with a notch that are subject to strain and toughness gradients, whose profiles are changed by varying the front width w : (A) When $w = 5 \times 10^{-3}$, there is no peeling; (B) For $w = 2 \times 10^{-3}$, exfoliation occurs. In both cases, all other parameters are the same as in Fig. 3A and B.

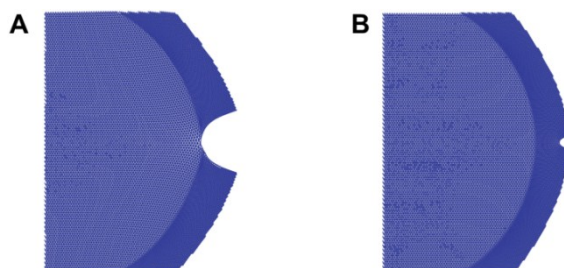


Fig. S3 Numerical simulations of circular elastic networks with a notch that are subject to a strain gradient (but no toughness gradient), whose profile is changed by varying the front width w : (A) $w = 1 \times 10^{-3}$; (B) $w = 2 \times 10^{-3}$. In both cases, all other parameters are the same as in Fig. 3C.

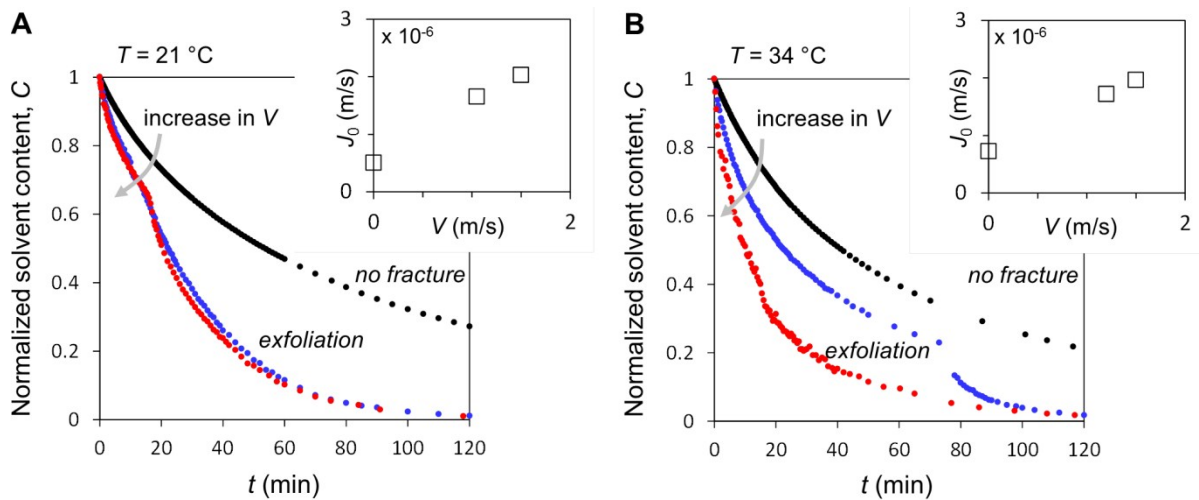


Fig. S4 Effects of change of wind speed V on drying rate of swollen cylindrical gels at two different ambient temperatures T : (A) $T = 21\text{ }^{\circ}\text{C}$ ($V = 0, 1.1$, and 1.5 m/s for black, blue, and red circles) and (B) $T = 34\text{ }^{\circ}\text{C}$ ($V = 0, 1.2$, and 1.5 m/s for black, blue, and red circles). The black circles in (A) and (B) are the same data points as shown in Fig. 2A. Insets: Initial evaporation flux J_0 plotted against V .

Description for Supplementary Movies:



Movie S1 (File name: MovieS1.mov)

Illustrative example showing recurrent spontaneous exfoliation of a drying solvent-infused cross-linked gel. The radius of the hemispherical gel in the initial swollen state is 21 mm. The movie is sped up by a factor of 512, with respect to real time.



Movie S2 (File name: MovieS2.mov)

Slow drying of the solvent-infused cylindrical gel (initial radius = 13 mm, length = 63 mm) at room temperature. The gel loses solvent by evaporation and shrinks gradually without any cracking or peeling. The movie is sped up by a factor of 512.



Movie S3 (File name: MovieS3.mov)

Rapid drying of the solvent-infused cylindrical gel at a temperature above a critical temperature for the onset of exfoliation. The gel shrinks upon drying and undergoes repeated cycles of cracking and peeling. The initial gel size and movie speed are the same as in Movie S2.