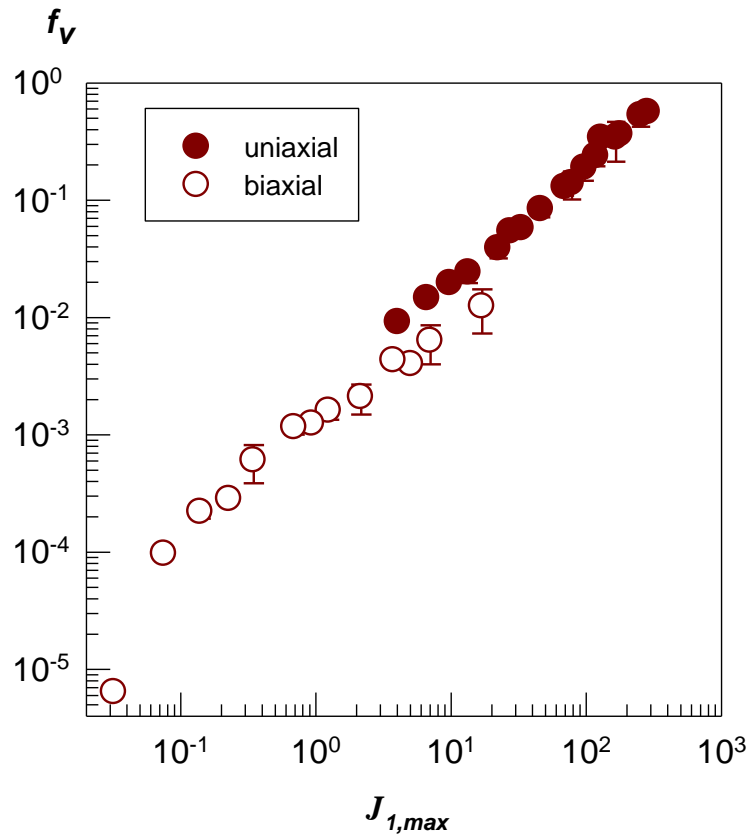
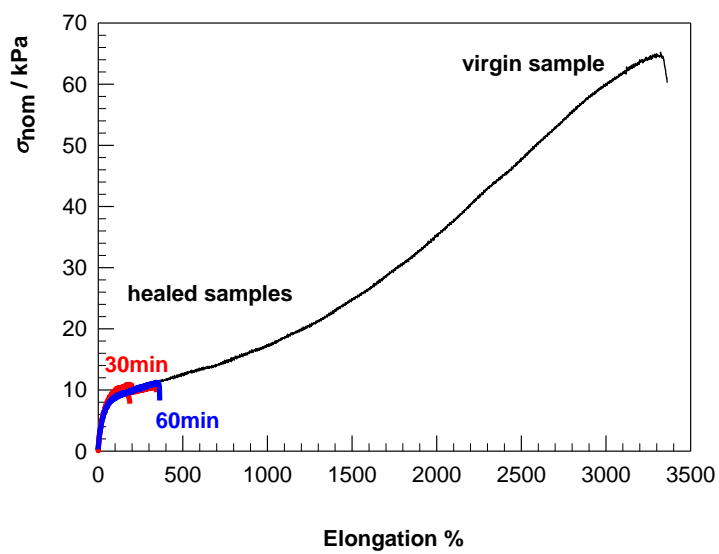


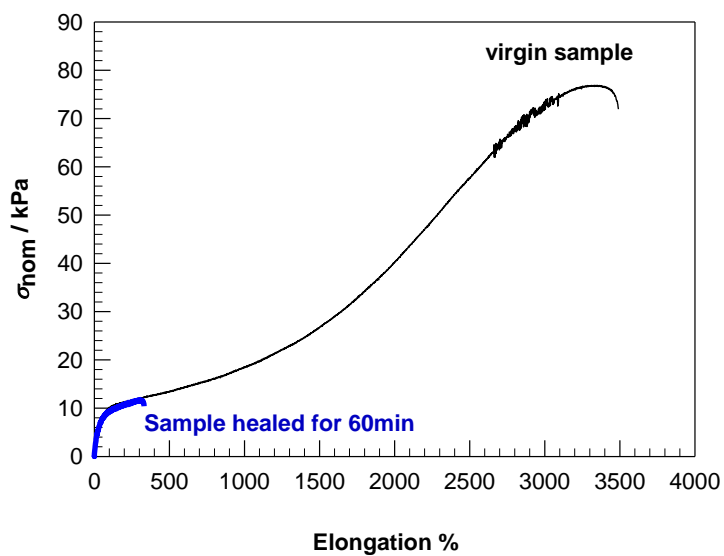
## Supplementary Figures



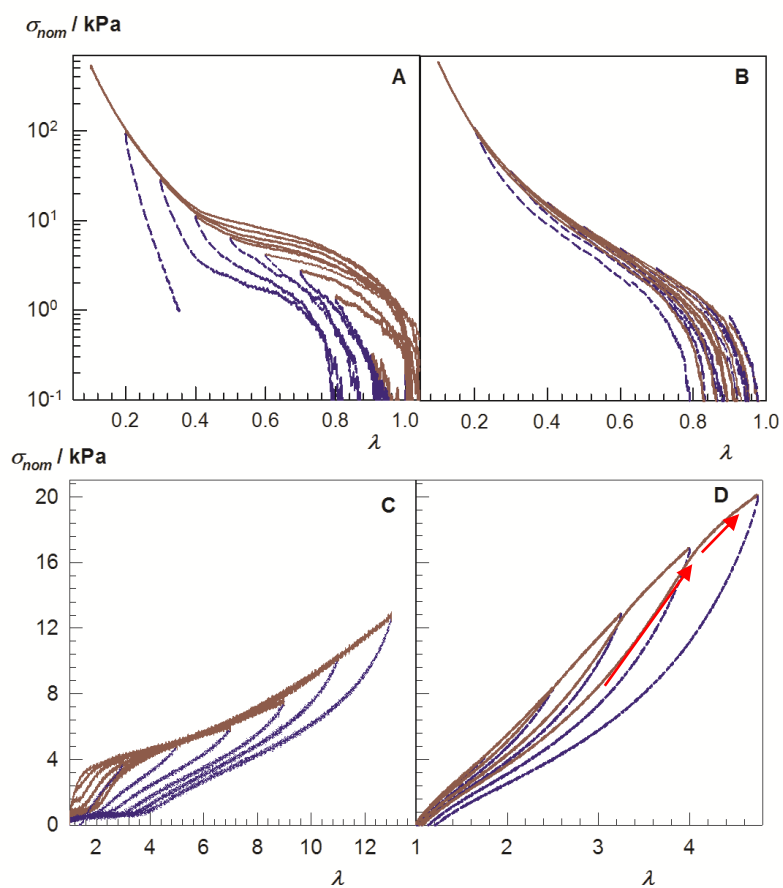
**Fig. S1.** The fraction  $f_v$  of dissociated crosslinks during the loading / unloading experiments shown as a function of the maximum value  $J_{1,max}$  of the first strain invariant, which equals to  $\lambda^2 + 2/\lambda - 3$  for uniaxial deformation.



**Fig. S2.** Stress-strain curves of virgin and healed gel samples. Healing times are indicated. Initial monomer concentration = 20 %. SDS = 7 %.



**Fig. S3.** Stress-strain curves of virgin and healed gel samples. Healing time is indicated. Initial monomer concentration = 20 %. SDS = 8.5 %.



**Fig. S4.** Nominal stress  $\sigma_{nom}$  vs deformation ratio  $\lambda$  curves from cyclic compression (A, B) and elongation tests (C, D) for the gel samples before (left panel) and after swelling in water (right panel). The tests were conducted with increasing strain.