

Supplementary Information

Ballistic and Blast-Relevant, High-Rate Material Properties of Physically and Chemically Crosslinked Hydrogels

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Supplementary Table 1:

Material	Model	Concentration[%]	G_{∞} [kPa]	G [kPa]	μ [Pa·s]	α	NRMSE
Polyacrylamide[14]	qKV	3 (v/v)	0.57	-	0.060±0.057	0.960±0.058	$4.05 \times 10^{-3} \pm 2.02 \times 10^{-3}$
	NHKV	3 (v/v)	0.57	8.31±0.43	0.093±0.073	-	$4.10 \times 10^{-3} \pm 2.05 \times 10^{-3}$
	qKV	8 (v/v)	2.77	-	0.186±0.194	0.480±0.140	$2.58 \times 10^{-3} \pm 1.89 \times 10^{-3}$
	NHKV	8 (v/v)	2.77	15.09±4.35	0.209±0.180	-	$3.13 \times 10^{-3} \pm 2.19 \times 10^{-3}$
Agarose[16]	qKV	0.5 (w/w)	2.11±0.11	-	0.054±0.015	0.880±0.147	$9.85 \times 10^{-3} \pm 1.66 \times 10^{-2}$
	NHKV	0.5 (w/w)	2.11±0.11	27.82±8.56	0.170±0.092	-	$8.29 \times 10^{-3} \pm 1.06 \times 10^{-2}$
	qKV	1 (w/w)	12.38±0.14	-	0.210±0.032	0.460±0.051	$3.86 \times 10^{-3} \pm 6.64 \times 10^{-3}$
	NHKV	1 (w/w)	12.38±0.14	58.12±9.38	0.300±0.092	-	$3.70 \times 10^{-3} \pm 6.30 \times 10^{-3}$
	qKV	2.5 (w/w)	81.05±0.17	-	0.190±0.105	0.104±0.006	$2.24 \times 10^{-3} \pm 2.05 \times 10^{-3}$
	NHKV	2.5 (w/w)	81.05±0.17	114.64±4.85	0.110±0.046	-	$1.84 \times 10^{-3} \pm 1.78 \times 10^{-3}$
	NHKV	5 (w/w)	333.63±0.11	282.37±22.83	0.500±0.065	-	$1.44 \times 10^{-2} \pm 7.61 \times 10^{-3}$
Gelatin	qKV	6 (w/v)	0.74±0.02	-	0.023±0.025	5.481±1.329	$1.37 \times 10^{-3} \pm 2.03 \times 10^{-3}$
	NHKV	6 (w/v)	0.74±0.02	12.78±3.69	0.027±0.022	-	$1.36 \times 10^{-3} \pm 1.86 \times 10^{-3}$
	qKV	10 (w/v)	3.08±0.01	-	0.098±0.040	4.053±0.792	$1.37 \times 10^{-3} \pm 1.96 \times 10^{-3}$
	NHKV	10 (w/v)	3.08±0.01	29.85±6.20	0.055±0.061	-	$1.43 \times 10^{-3} \pm 1.95 \times 10^{-3}$
	qKV	14 (w/v)	6.71±0.03	-	0.018±0.007	7.106±1.411	$1.74 \times 10^{-3} \pm 2.29 \times 10^{-3}$
	NHKV	14 (w/v)	6.71±0.03	101.50±4.01	0.166±0.208	-	$8.92 \times 10^{-4} \pm 9.66 \times 10^{-4}$

Table S1: Summary of both qKV and NHKV IMR-fitted viscoelastic material properties for PAAm, Agarose, and Gelatin over a strain rate envelope of $10^3 \text{ s}^{-1} \sim 10^6 \text{ s}^{-1}$ and the associated NRMSE values for each model.