

ADVANCED FUNCTIONAL MATERIALS

Supporting Information

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Ultra-High Toughness Fibers Using Controlled Disorder
of Assembled Aramid Nanofibers

*Hyun Chan Kim and Henry Angelo Sodano**

Supporting Information

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Hyun Chan Kim¹ and Henry Sodano^{1,2,3*}

1 Department of Aerospace Engineering, University of Michigan, Ann Arbor, MI, 48109, USA

2 Department of Materials Science and Engineering, University of Michigan, Ann Arbor, MI, 48109, USA

3 Department of Macromolecular Science and Engineering, University of Michigan, Ann Arbor, MI, 48109, USA

*Address correspondence to: hsodano@umich.edu

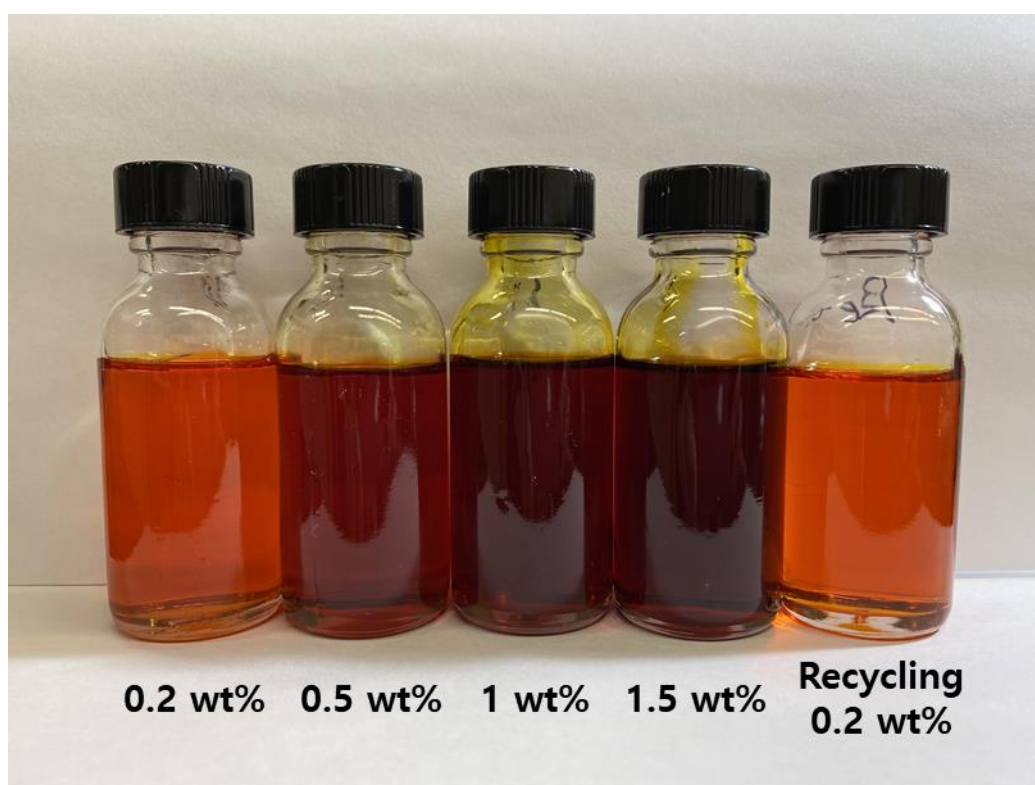


Figure S1. ANFs colloidal suspensions with different concentrations and recycling.

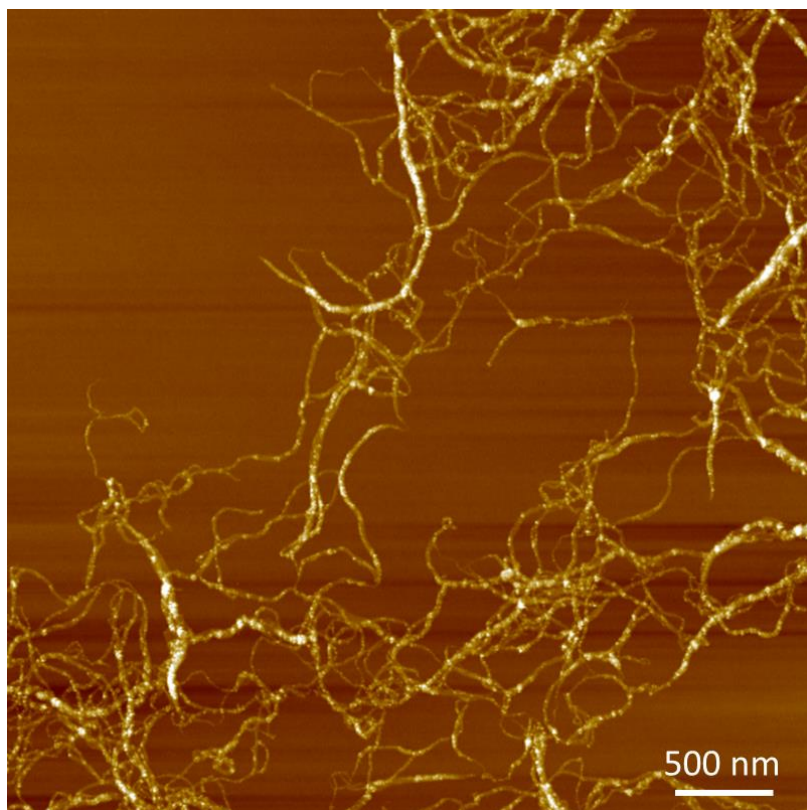


Figure S2. Distribution of ANFs through the mass protonation process and washing

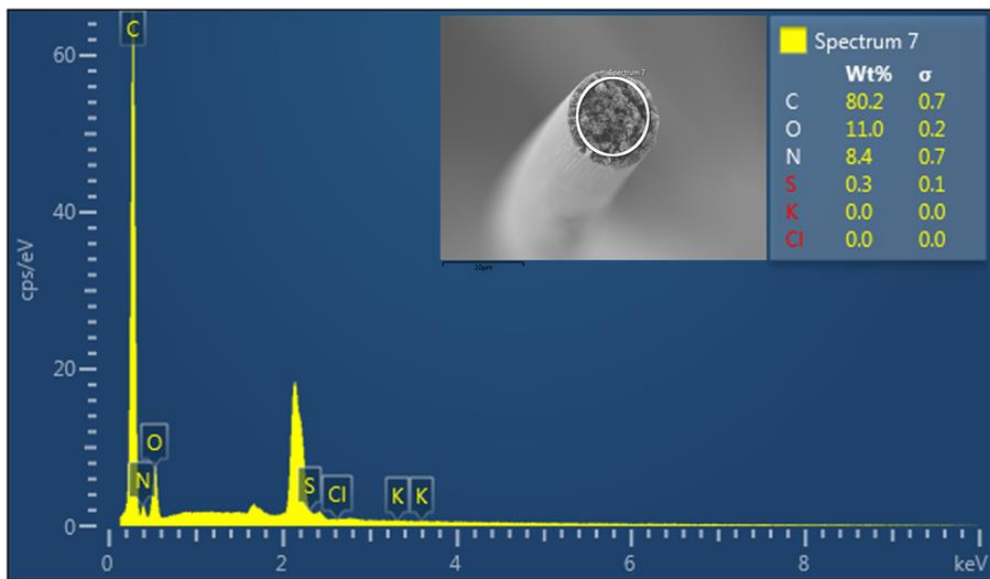


Figure S3. SEM-EDS result of ANF assembled fiber.

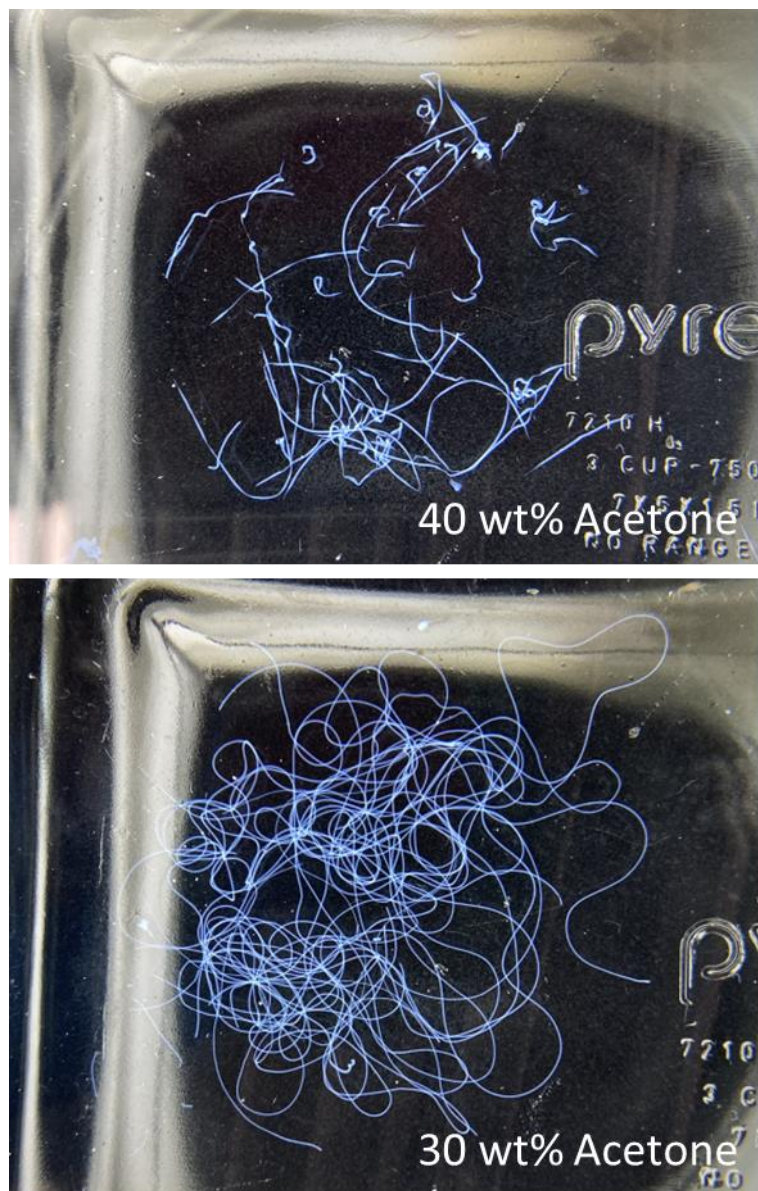


Figure S4. The effect of a slow protonation rate on the wet spinning process. Gel state fibers produced discontinuously with an excessively slow protonation rate in 40 wt% diluted Acetone (top). Gel state fibers produced continuously with a slowed protonation rate of the acquired thresholds in this study as 30 wt% diluted Acetone (bottom).

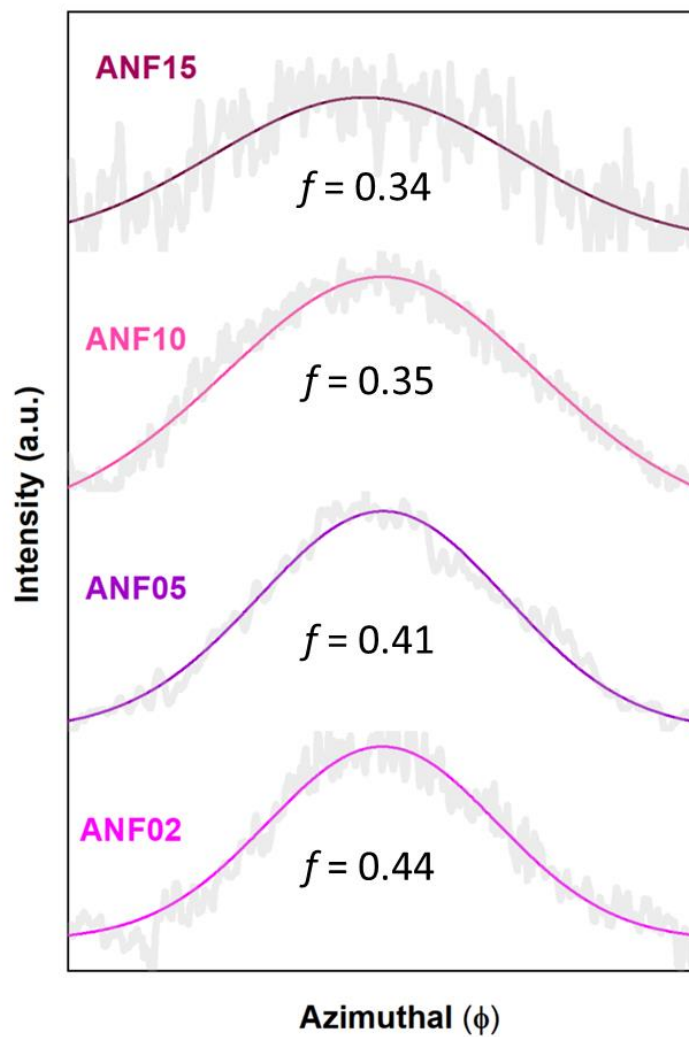


Figure S5. Azimuthal intensity profiles at (200) plane of the filaments made with different concentrations of ANFs colloidal suspension in diluted acetone baths.

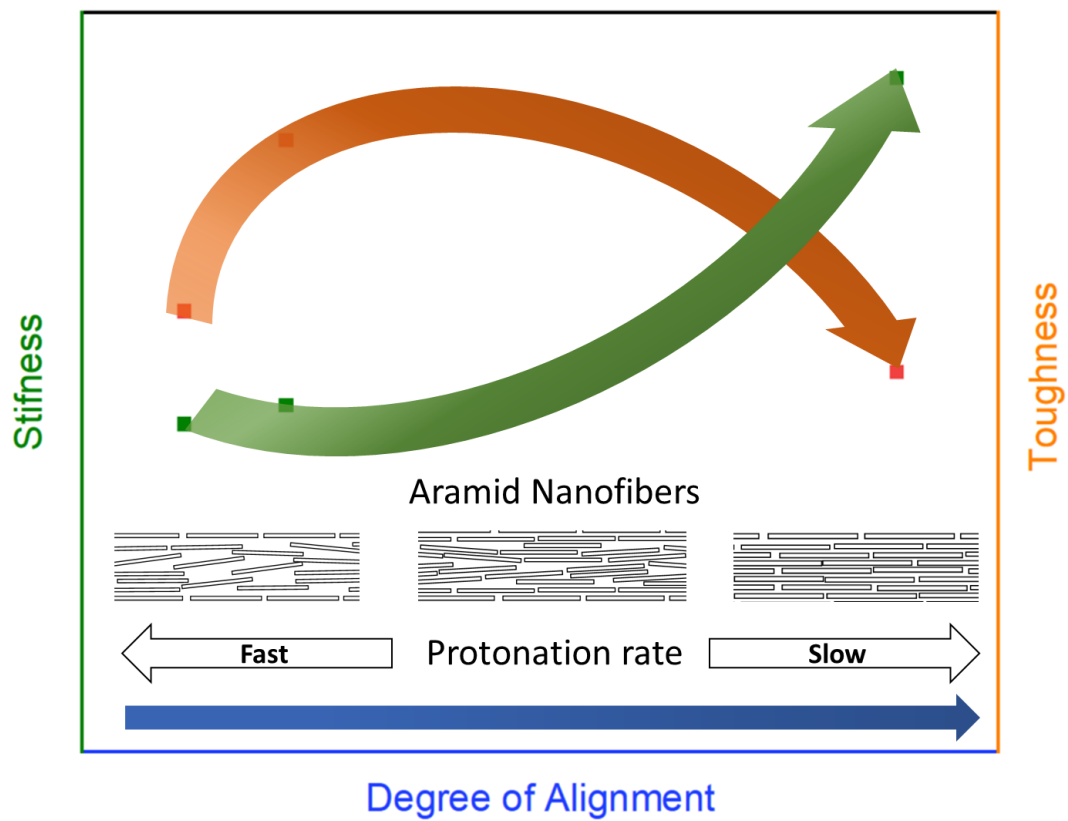


Figure S6. Schematic diagram of the correlation between stiffness, toughness, and degree of alignment with different protonation rates and ANFs network structure.

Condition	Diameter (μm)
ANF-Acetone (0.2 wt%)	5.81 ± 0.55
ANF-Water (0.2 wt%)	6.30 ± 0.52
ANF-HCl (0.2 wt%)	6.57 ± 0.53
ANF-Acetone (0.5 wt%)	12.48 ± 0.57
ANF-Acetone (1.0 wt%)	14.66 ± 0.85
ANF-Acetone (1.5 wt%)	17.61 ± 0.36
ANF-Annealing	5.61 ± 0.10
ANF-Acetone (narrow)	5.52 ± 0.18
ANF-Recycling	6.52 ± 0.15

Table S1. Diameters of fabricated ANFs assembled fibers with different experimental conditions.

CONCENTRATION	Aramid Fabric	DMSO	DI Water	KOH
0.2 wt%	0.3 g	150 mL	6 mL	0.45 g
0.5 wt%	0.75 g	150 mL	6 mL	0.6 g
1 wt%	1.5 g	150 mL	6 mL	0.75 g
1.5 wt%	2.25 g	150 mL	6 mL	1.125 g

Table S2. Prepared chemical composition of ANFs colloidal suspensions with different concentrations.