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Mechanisms of stability of electrospun polypeptide fibers[1] ALINA GITNIK, University of Texas at Austin, DHAN B. KHADKA, MICHAEL C. CROSS, NICOLE K. LE, DONALD T. HAYNIE, University of South Florida — Electrospun nano- and microfibers made of biodegradable and absorbable polymers are of great interest in biomedical engineering for tissue engineering, wound healing and other purposes. We have investigated physical properties of fibers made of the synthetic organic polymer co-poly(L-glutamic $acid_4$, L-$tyrosine_1$) (PLEY). This water-soluble polypeptide has a net negative charge at neutral pH. Dehydrated fibers are crosslinked with a diimide reagent dissolved in ethanol, giving a maximum average number of crosslinks of 1 per polymer molecule. Fiber integrity has been assessed in an aqueous medium at pH 2, 7 and 12, before and after crosslinking. Non-crosslinked fibers dissolved rapidly at all pH values, on a timescale of seconds to minutes. Crosslinked fibers dissolved completely at pH 12, but not at pH 2 or pH 7, the rate depending on the concentration of crosslinking reagent and therefore the density of crosslinks. Dissolution at pH 12 is attributable to ionization of the tyrosine side chain, which has a nominal pK_a of 10.4, an increase in electrostatic repulsion between side chains and the migration of counterions into the fiber. Fibers crosslinked in 50 mM EDC buckled on a timescale of minutes at pH 12 and dissolved shortly thereafter.

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