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Physical gelation of a microfiber suspension. ANTONIO PERAZZO, JANINE K NUNES, Department of Mechanical and Aerospace Engineering, Princeton University, STEFANO GUIDO, Department of Chemical, Materials and Production Engineering, University of Napoli "Federico II", HOWARD A STONE, Department of Mechanical and Aerospace Engineering, Princeton University — Hydrogels are among the most exploited materials in tissue engineering and there is growing interest in injectable hydrogels, especially as applied to surgical adhesives and bioprinting materials. Here we report a method to produce a hydrogel in a desired location by simply extruding a suspension of high aspect ratio and flexible microfibers from a syringe. The mechanism of gel formation is purely physical and based on irreversible entanglements formed by the microfibers under the action of flow. The single microfibers have been produced and finely tailored by microfluidic methods. Shear rheology has been performed in order to get insights on the entanglements, and results show that the formation of entanglements is related to a shear thickening behavior of the suspension, which in turn depends on shear rate and concentration of fibers. When shearing the suspension, highly non-linear viscoelastic behavior is observed and probed by a highly positive first normal stress difference. We also report the hydrogel swelling behavior and its linear viscoelastic properties as obtained by imposing small oscillatory stress to the material.

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