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**A Solutal Fingering Instability during Capillary Imbibition in Fibrous Media** CHRISTOPHER GUIDO, NICOLAS YOUNG, WILLIAM RISTENPART, Dept. Chemical Engineering and Materials Science, University of California Davis — We report the existence of a solute-driven, humidity-dependent fingering instability that occurs during capillary imbibition into cellulosic fibrous media (e.g., paper). For sufficiently low solute concentrations and sufficiently high ambient humidities, the imbibition front moves forward smoothly; for higher concentrations and lower humidities, however, the imbibition front develops spatially periodic fluctuations that grow with time. We derive and experimentally corroborate a stability criterion based on solute-induced changes in the air/liquid interfacial tension, which are magnified by liquid infiltration into a humidity-dependent precursor film. The results have broad implications for any process involving motion of liquids through fibrous media, including chromatographic separations, paper-based diagnostic assays, and conservation efforts involving aged manuscripts or artwork.

William Ristenpart  
Dept. Chemical Engineering and Materials Science,  
University of California Davis

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