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Irregular Deposition of Colloidal Particles in Fibrous Media during Capillary Spreading J.E. SANDERS, Westminster College, W.D. RISTENPART, H.A. STONE, Harvard University — When a drop of liquid is placed on a dry fibrous medium (e.g., paper or clothing), capillary suction induces the liquid to spread radially. Sufficiently small colloidal particles are entrained in the flow, and eventually deposit onto the fibers, forming a stain. Here we investigate the colloidal deposition patterns, and we report that under many conditions the highest concentration of particles is found at the periphery of the stain. This nonmonotonic radial distribution is qualitatively different from the exponential decay predicted in standard filtration theory. We explain the experimental observations in terms of a competition between capillary flow and colloidal-scale interactions. The results have implications for many processes in fibrous media, including stain removal, thin-layer chromatography, and bacterial growth in porous environments.

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