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Capillary rise and swelling in cellulose sponges JONGHYUN HA, JUNGCHUL KIM, HO-YOUNG KIM, Seoul National University — A cellulose sponge, which is a mundane example of a porous hydrophilic structure, can absorb and hold a significant amount of liquid. We present the results of experimental and theoretical investigation of the dynamics of the capillary imbibition of various aqueous solutions in the sponge that swells at the same time. We find that the rate of water rise against the resistance caused by gravitational and viscous effects deviates from Washburns rule beyond a certain threshold height. We rationalize the novel power law of the rise height versus time by combining Darcys law with hygroscopic swelling equation and also predict the threshold height. The scaling law constructed through this work agrees well with the experimental results, shedding light on the physics of capillary flow in deforming porous media.

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