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Switchable capillary bridges in sphere packings CHRISTOPH GÖGELEIN, MARTIN BRINKMANN, MATTHIAS SCHRÖTER, STEPHAN HERMINGHAUS, Max-Planck-Institute for Dynamics and Self-Organization — If one adds a small amount of water to a heap of sand, it becomes paste-like since the grains get interconnected by capillary bridges. Due to this effect, we can easily sculpture wet sand (e.g., building a sand castle), whereas a heap of dry grains ripples away and cannot sustain any shape. In the present work, we use a non-Brownian suspension of glass spheres immersed in a binary liquid mixture. The suspending water-lutidine mixture exhibits a well studied lower critical point slightly above ambient temperature. Hence, the mixture starts to phase separate upon heating. Since the water-rich phase wets the hydrophilic glass spheres, capillary bridges are formed between adjacent particles. If the system is cooled below the demixing temperature, the bridges disappear within a few seconds by intermolecular diffusion. Thus, this systems offers the opportunity to switch the capillary bridges on and off by altering the temperature. In this presentation, we will show the temperature-induced formation of capillary bridges using confocal and bright light microscopy [1]. Furthermore, we will discuss the effect of capillary bridges on random sphere packings using a fluidized bed setup.

[1] C. Gögelein, M. Brinkmann, M. Schröter, and S. Herminghaus, Langmuir 26 (2010) 22, 17184.

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