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Catch and release of bubbles in a soft granular medium[1] CHRIS MACMINN, JIAN HUI GUAN, University of Oxford, OMID DOROSTKAR, University of Oxford and ETH Zrich, SUNGYON LEE, University of Minnesota — A liquid-saturated packing of soft particles can behave like a complex fluid or like a porous solid, depending on the solid fraction. In the fluid-like state, invading gas bubbles will rise through the packing due to buoyancy with a rise velocity that decreases as the solid fraction increases. In the solid-like state, invading gas bubbles cannot rise unless their buoyancy overcomes the capillary entry pressure between the particles, in which case they will rise by migrating through the pore space of the packing. Here, we combine laboratory experiments with discrete-element simulations to show that the motion of gas bubbles through such a packing can be controlled by exploiting this dichotomy: Active manipulation of the solid fraction in a soft porous medium can be used for on-demand catch and release of individual gas bubbles.

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