Abstract Submitted
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Using micro-3D printing to build acoustically driven microswimmers.[1] NICOLAS BERTIN, CNRS Grenoble, OLIVIER STEPHAN, PHILIPPE MARMOTTANT, Universite Joseph Fourier, Grenoble, TAMSIN SPELMAN, ERIC LAUGA, University of Cambridge, DYFCOM TEAM[2], COMPLEX AND BIOLOGICAL FLUIDS TEAM[3] — With no protection, a micron-sized free air bubble at room temperature in water has a life span shorter than a few tens of seconds. Using two-photon lithography, which is similar to 3D printing at the micron scale, we can build "armors" for these bubbles: micro-capsules with an opening to contain the bubble and extend its life to several hours in biological buffer solutions. When excited by an ultrasound transducer, a 20 μm bubble performs large amplitude oscillations in the capsule opening and generates a powerful acoustic streaming flow (velocity up to dozens of mm/s). A collaboration with the Dept. of Applied Mathematics and Theoretical Physics, University of Cambridge, is helping us predict the true resonance of these capsules and the full surrounding streaming flow. The present Bubbleboost project aims at creating red blood cell sized capsules ($\sim$ 10-20 μm) that can move on their own with a non-contact acoustic excitation for drug delivery applications. Another application of this research is in microfluidics: we are able to fabricate fields of capsules able to generate mixing effects in microchannels, or use the bubble-generated flow to guide passing objects at a junction.

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