

## Experimental

Calcium carbide ( $\text{CaC}_2$ ), sodium dodecyl sulfate (SDS) and polysulfone (PSf) and *N, N'*-dimethylformamide (DMF) were purchased from Sigma-Aldrich.

The capsule precursor was prepared by mixing polysulfone with *N, N'*-dimethylformamide and dissolved into a clear solution using an ultrasonic bath for 30 min. The concentration of polysulfone (PSf) in DMF (PSf/DMF) was 10 % by weight.

Encapsulation of calcium carbide was carried out using a phase inversion strategy. Typically, a calcium carbide granule with an approximate dimension of 3 mm at each end was chosen. The granule was introduced into a 10 % *wt.* PSf/DMF solution, followed by the immersion into ethanol, where the phase inversion occurred. The encapsulated calcium carbide was left to dry for 5 minutes before being used for propulsion experiments.

The propulsion experiments were carried out in a glass container with dimensions 20 cm x 20 cm x 5.5 cm depth. An aqueous solution containing 0.05 % SDS was placed into the dish. A Casio HD video-recorder was placed over the glass container to capture the motion of the capsule motor. The video sequences were analysed using Nikon NIS-Elements software, where the average velocities were calculated.