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Algal cell disruption using microbubbles to localize ultrasonic energy for biofuel extraction JOEL KREHBIEL, LANCE SCH, DANIEL KING, JONATHAN FREUND, Univ of Illinois - Urbana — Cell disruption is a critical step in the production of algal-based biofuels, but current mechanical disruption methods require significant energy, typically more than actually available in the cell's oil. We propose and investigate an ultrasound disruption process using ultrasound contrast agents to localize the delivered energy. Experiments in a flow cell with focused ultrasound show a significant benefit. The degree of disruption increases with increasing peak rarefactional ultrasound pressure for pressures between 1.90 and 3.07 MPa and increasing microbubble concentration up to 12.5×10^7 bubbles/ml. Estimates suggest the energy of this method is less than one fourth of the energy of other industrial mechanical disruption techniques and comparable with theoretical disruption estimates. The increase in efficiency would make this technique viable for bioenergy applications.

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