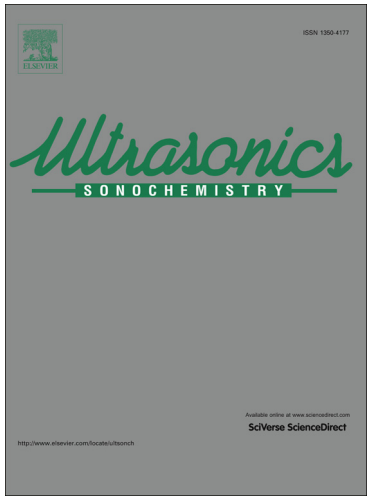

Advances in high frequency ultrasound separation of particulates from biomass

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Abstract

In recent years the use of high frequency ultrasound standing waves (megasonics) for droplet or cell separation from biomass has emerged beyond the microfluidics scale into the litre to industrial scale applications. The principle for this separation technology relies on the differential positioning of individual droplets or particles across an ultrasonic standing wave field within the reactor and subsequent biomass material predisposition for separation *via* rapid droplet agglomeration or coalescence into larger entities. Large scale transducers have been characterised with sonochemiluminesce and hydrophones to enable better reactor designs. High frequency enhanced separation technology has been demonstrated at industrial scale for oil recovery in the palm oil industry and at litre scale to assist olive oil, coconut oil and milk fat separation. Other applications include algal cell dewatering and milk fat globule fractionation. Frequency selection depends on the material properties and structure in the biomass mixture. Higher frequencies (1 and 2 MHz) have proven preferable for better separation of materials with smaller sized droplets such as milk fat globules. For palm oil and olive oil, separation has been demonstrated within the 400-600 kHz region, which has high radical production, without detectable impact on product quality.

Keywords

Ultrasound, high frequency, reactor, design, separation, oil, fat, biomass

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