Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Investigation of Gas Holdup in a Vibrating Bubble Column SHAHROUZ MOHAGHEGHIAN, BRIAN ELBING, Oklahoma State University — Synthetic fuels are part of the solution to the world's energy crisis and climate change. Liquefaction of coal during the Fischer-Tropsch process in a bubble column reactor (BCR) is a key step in production of synthetic fuel. It is known from the 1960's that vibration improves mass transfer in bubble column. The current study experimentally investigates the effect that vibration frequency and amplitude has on gas holdup and bubble size distribution within a bubble column. Air (disperse phase) was injected into water (continuous phase) through a needle shape injector near the bottom of the column, which was open to atmospheric pressure. The air volumetric flow rate was measured with a variable area flow meter. Vibrations were generated with a custom-made shaker table, which oscillated the entire column with independently specified amplitude and frequency (0-30 Hz). Geometric dependencies can be investigated with four cast acrylic columns with aspect ratios ranging from 4.36 to 24, and injector needle internal diameters between 0.32 and 1.59 mm. The gas holdup within the column was measured with a flow visualization system, and a PIV system was used to measure phase velocities. Preliminary results for the non-vibrating and vibrating cases will be presented.

Brian Elbing
Oklahoma State Univ

Date submitted: 27 Jul 2015 Electronic form version 1.4