ASIA-PACIFIC
SOLAR RESEARCH CONFERENCE

An innovative configuration of two interconnected bubble reactors for pneumatic circulation of a high temperature liquid

M. Jafarian, M.M. Sarafraz, M. Arjomandi and G. J. Nathan

Centre for Energy Technology, Schools of Mechanical

The University of Adelaide, SA 5005, Australia

A novel configuration of two inter-connected bubble column reactors is presented to facilitate the circulation of a high temperature and/or corrosive liquids between two bubble column reactors, enabling it to react with two different gases. The system comprises two bubble columns, configured such that the outlet from each bubble column is connected to the inlet of the other. The jet of inlet gas to each column induces a lift, augmented by buoyancy due to the density difference between the liquid columns and that in the connecting pipes, driving a circulation of the liquid between the reactors. The demonstration of this system in a cold prototype is shown in Figure 1. Water and air are employed as the circulating fluid and the injection gas. An ultrasonic flow meter is used to measure the flow rate of circulating water between the bubble columns with a sampling rate of 10 Hz. A sampling time of 60 s was also selected (for a total of 600 measurements). An image processing technique was also developed and calibrated aganist available data in literature to monitor the gas hold up wihinth each column. The measurements demonstrate the circuilation of the liquid between the reactors. The rate of liquid circulation between the bubble columns was also found to increase with both the height of liquid in bubble columns and the gas flow rate of injected gas.

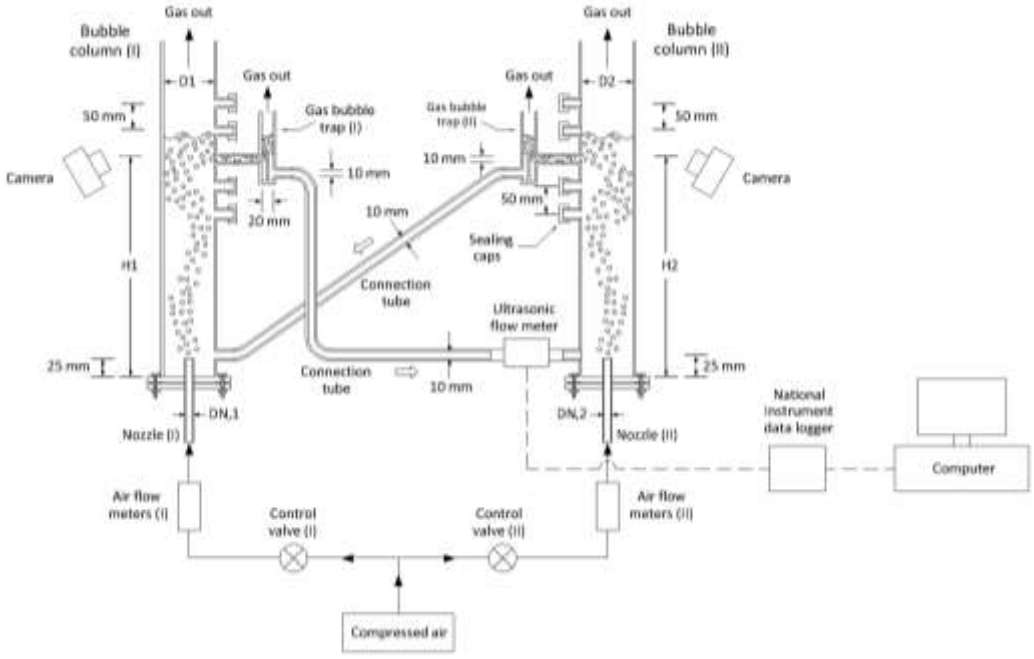

Figure 1. Schematic diagram of the cold experimental set-up employed in this study. The ultrasonic flow meter is used for measurement of the flow rate of circulating water between the bubble columns. A camera was also to take photoes of columns which were then used to measure gas hold up in columns.