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Microcantilevers with strain gauges as active and passive bubble sensors MATTHEW STEGMEIR, ELLEN LONGMIRE, Aerospace Engineering & Mechanics, University of Minnesota, SUSAN MANTELL, MUBASSAR ALI, Mechanical Engineering, University of Minnesota — In the current study, we investigate the sensitivity of microfabricated cantilevers with integrated strain gauge sensing to collisions of air bubbles in confined water channel flow. The vertical channel used is 585mm long with a 10mmx2mm cross-section. Flow is upward. Bubbles of diameter 400-2000μm are examined. Flow Reynolds numbers based on mean fluid velocity and hydraulic diameter of 1000-2500 are considered. Cantilevers extend from the center of the 2mm wall and are oscillated perpendicular to the flow direction. Bubbles are introduced upstream of cantilever mounting location and travel in the direction of the flow. Cantilever sizes of 6mmx2mm and 3mmx0.5mm with thickness $\sim$125μm and resonance frequencies of 340Hz and 2670Hz in water are considered. Bubble impacts are recorded using a high frame-rate camera. Strain gauge data are correlated with images. Active and passive results are considered for each beam. Changes in the instantaneous sinusoidal amplitude of the strain gauge signal are used to detect impacts. The effects of impacts on the signal from the strain gauge will be discussed. Results indicate that active sensing using the shorter, stiffer beam is most effective at detecting bubble impacts. Supported by the National Science Foundation (CMS-0300125).

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