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Quantitative Visualization of Two-Phase Flow in a Model of a Fuel Cell Gas Transport Channel GRANT MINOR, PETER OSHKAI, NEDJIB DJILALI, University of Victoria — Two phase air-water flow in a model of a proton exchange membrane fuel cell (PEMFC) gas distribution channel is investigated experimentally using a quantitative flow imaging of the liquid phase. A rectangular PEMFC gas channel model was fabricated from polydimethylsiloxane (PDMS), glass, and carbon paper. Micro-digital-particle-image-velocimetry (micro-DPIV) techniques are used to provide qualitative and quantitative visualizations of flow inside a water droplet adhered to the bottom wall of a gas channel and exposed to an air flow within the channel. Velocity measurements within several cross-sectional planes inside a droplet placed in the channel are obtained for a range of air flow rates. Particle streak images are obtained for qualitative analysis of the flow. Relationships between air velocity in the channel, secondary rotational flow inside a droplet, droplet deformation, and contact angle hysteresis are examined. In addition, quantitative rotational flow patterns within the droplet are acquired using micro-DPIV. The resulting flow fields provide insight into the interactions between the air and water flows that occur at the gas-liquid interface.

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