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# Microbubble Beam (MBB), A Potential Dispersion Mechanism for Multiphase Gas-Liquid Microreactor Systems

**George N. Doku,† Willem Verboom,‡ David N. Reinhoudt,‡ and Albert van den Berg*,†**

*Laboratory of (Micro)Biomedical and Environmental Technology and Laboratory of Supramolecular Chemistry and Technology, MESA+ Research Institute, University of Twente, P.O. Box 217, 7500 AE Enschede, The Netherlands*

## Abstract

Systems consisting of single and multiple micropipet tips mounted in a channel for the generation of microbubble beams (MBB, as a gas-liquid dispersion mechanism) in moving liquids were constructed in stainless steel housing with Pyrex windows on both sides of the housing for imaging. Pressure head effects were used to pump the liquid through the channel, while air obtained directly from a pressurized source was introduced through the micropipets into the channel perpendicular to the (main) liquid flow direction. The effects of the liquid velocity, gas supply pressure, pipet hole size, liquid temperature, liquid viscosity, pipet-liquid hydrophilicity, and multiple-pipet configurations on the bubble generation and the bubble size, quantity, and speed have been investigated. Reverse hydrophilicity is required of the pipet and the liquid so as to reduce gas-supply pressure requirements. Specific interfacial contact areas estimated were about 2-10 times larger than those reported until now in the literature for the microbubble columns employed in microreactor systems, and even far larger than those reported for conventional/traditional gas-liquid contacting equipment, suggesting a superior performance for the MBB dispersion technique in future microreactor applications. Multiple micropipette configuration, rather than one large pipet hole, is the recommended means of increasing the gas quantity requirements, with enough inter-pipet distances and pipet height differences so as to prevent bubble coalescence.