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Quantized Concentration Gradient in Picoliter Scale

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Generation of concentration gradient is of paramount importance in the success of reactions for cell biology, molecular biology, biochemistry, drug-discovery, chemotaxis, cell culture, biomaterials synthesis, and tissue engineering. In conventional method of conducting reactions, the concentration gradients is achieved by using pipettes, test tubes, 96-well assay plates, and robotic systems. Conventional methods require milliliter or microliter volumes of samples for typical experiments with multiple and sequential reactions. It is a challenge to carry out experiments with precious samples that have strict limitations with the amount of samples or the price to pay for the amount. In order to overcome this challenge faced by the conventional methods, fluidic devices with micrometer scale channels have been developed. These devices, however, cause restrictions on changing the concentration due to the fixed gradient set based on fixed fluidic channels.[1,2] Here, we present a unique microfluidic system that can generate quantized concentration gradient by using series of droplets generated by a mechanical valve based injection method.[3,4] **Acknowledgement:** All this work has been done by Sachin Jambovane, Kirn Cramer, Woon Seob Lee, and Hoon Suk Rho. The presenter would like to thank them.

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[2]Jambovane, S.; Hong, J. W., Lorenz-like Chatotic System on a Chip In *The 14th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS)*, The Netherlands, October, 2010.

[3]Jambovane, S.; Rho, H.; Hong, J., Fluidic Circuit based Predictive Model of Microdroplet Generation through Mechanical Cutting. In *ASME International Mechanical Engineering Congress & Exposition*, Lake Buena Vista, Florida, USA, October, 2009.

[4]Lee, W.; Jambovane, S.; Kim, D.; Hong, J., Predictive Model on Micro Droplet Generation through Mechanical Cutting. *Microfluidics and Nanofluidics,* 7, (3), 431-438, 2009.