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Microfluidic liquid-air dual-gradient chip for synergic effect bio-evaluation of air pollutant

Xian-Jun Liu^a, Shan-Wen Hu^b, Bi-Yi Xu^{b*}, Ge Zhao^a, Xiang Li^a, Fu-Wei Xie^{a*},
Jing-Juan Xu^b, Hong-Yuan Chen^b

a. Zhengzhou Tobacco Research Institute of CNTC, No. 2 Fengyang Street,
Zhengzhou, 450001, People's Republic of China

b. State Key Laboratory of Analytical Chemistry for Life Science and Collaborative
Innovation Centre of Chemistry for Life Sciences, School of Chemistry and Chemical
Engineering, Nanjing University, Nanjing 210023, People's Republic of China

Corresponding author: *Bi-Yi Xu Tel./Fax: +86-25-89687294. E-mail:

xuby@nju.edu.cn; *Fu-Wei Xie Tel: +86-371-67672502. E-mail: xiefuwei@sina.com

Abstract

In this paper, a novel prototype liquid-air dual gradient chip is introduced, which has paved the way for effective synergic effect bio-evaluation of air pollutant. The chip is composed of an array of the agarose liquid-air interfaces, top air gradient layer and bottom liquid gradient layer. The novel agarose liquid-air interface allows for non-biased exposure of cells to all the substances in the air and diffusive interactions with the liquid phase; while the dual liquid-air gradient provides powerful screening abilities, which well reduced errors, saved time and cost from repeated experiment. Coupling the two functions, the chip subsequently facilitates synergic effect evaluation of both liquid and air factors on cells. Here cigarette smoke was taken as the model air pollutant, and its strong synergic effects with inflammatory level of A549 lung cancer cells on their fate were successfully quantified for the first time. These results well testified that the proposed dual-gradient chip is powerful and indispensable for bio-evaluation of air pollutant.

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