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LumiSense - A portable water pollutant monitoring system using whole cell array

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Whole cell sensors have been proposed as powerful tools to detect class-specific toxicants based upon their biological activity and bioavailability. A whole cell sensor uses live cells as the sensing elements for harmful chemicals. In this talk, I will demonstrate a robust toxicant detection platform based on a whole cell sensor array biochip (LumiChip). LumiChip harbors an integrated temperature control and a 16-member sensor array, as well as a simple but highly efficient lens-free bioluminescence collection setup. On LumiChip, samples are infused in an oxygen-permeable microfluidic flow channel to reach the sensor array. Time-lapse changes in the bioluminescence emitted by the array members are measured on a single linear charge-coupled device (CCD) commonly used in commercial industrial process control or in barcode readers. Removal of the protective window on the linear CCD allowed lens-free direct interfacing of LumiChip to the CCD surface for high numerical aperture measurement. Bioluminescence induced by simulated contamination events was detected within 15 to 45 minutes. The portable LumiSense system utilizing the linear CCD in combination with the miniaturized Lumichip is a promising potential platform for on-site water pollutant monitoring.

Biography

Ji-Yen Cheng received his PhD degree in Chemistry Department of National Taiwan University. After graduation in 1998, he started his Post-doc research on the DNA microarray in Institute of Biomedical Sciences in Academia Sinica Taiwan. In 2001, he became an Assistant Researcher in Research Center for Applied Sciences in Academia Sinica and was promoted to research fellow in 2013. His research interest is in the biological applications of microfluidics. Some specific topics include the following: Cell response in weak DC EF (electrotaxis)/Rapid prototyping of microfluidic biochip using laser micromachining/nanostructure biosensor/and portable whole-cell sensor.

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