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DIRECT MEASUREMENT OF THE LOCAL TEMPERATURE INCREMENT FOR INDIVIDUAL LIVE CELLS

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Optical nano-thermometers have been well developed to measure the temperature distribution in live cells. Nano-sized indicators such as proteins, organic dyes, quantum dots, polymer particles and nano-diamond, are injected into live cells, and the change in intensity, peak position or lifetime of luminescence spectra for the nano-indicators are used to reveal the change of local temperatures. However, the results are remarkably affected by local environment, e.g., pH value, cellular viscosity and ion concentration in the cytosol, thus causing controversial arguments. Here, we report direct measurement results for the temperatures of individual cultured cancer cells. By using double-stabilized measurement system and array of micro-scale thin-film thermocouples, we have reduced the system thermal noise down to ±5 mK and observed local increments in temperature for individual live cells in the range of 30-280 mK. With further improvements, e.g., by using arrays nano-scaled thermocouples, the current method is promising for real-time 2D mapping for the local temperatures of a single cell.

Biography

Shengyong Xu received his BSc in Physics from the Peking University in 1988 and PhD from Department of Physics, National University of Singapore in 1999. He is currently a professor with Department of Electronics, School of Electronics Engineering and Computer Sciences, Peking University. He has published more than 200 journal and conference papers. His group currently works on the physics of electrical communication among neuron cells and normal cells, temperature sensing at the cell and sub-cell levels, as well as electrostatic tweezers at micro-nano-scales.

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