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細胞実験のためのマイクロシステムの開発

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Development of Microsystems for Cellular Experiments

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Abstract

Cellular experimental systems become a major trend in μ-TAS research field. Various kinds of cells were used in the microfluidic systems, such as primary culture of mammalian cells and cell lines, bacteria, and yeast. A wide variety of analysis systems have been reported so far, including cell sorter, cellular imaging, and bioassay systems. Recently, parallelization by multichannel systems was also realized. These systems were superior in efficiency of the processes and small consumption of precious cells and expensive reagents.

金ナノ粒子による目視 SNPs 識別法

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Non-cross-linking gold nanoparticle aggregation for sensitive detection of single-nucleotide polymorphisms

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Abstract

Aggregation of DNA-modified gold nanoparticles in a non-cross-linking configuration has extraordinary selectivity against terminal mismatch of the surface-bound duplex. In this paper, we demonstrate the utility of this selectivity for detection of single-base substitutions. The samples were prepared through standard protocols: DNA extraction, PCR amplification, and single-base primer extension. Oligonucleotide-modified nanoparticles correctly responded to the unpurified products from the primer extension: aggregation for the full match and dispersion for all the mismatches. Applicability of this method to genomic DNA was tested with five human tumor cell lines, and verified by conventional technologies: mass spectrometry and direct sequencing. Unlike the existing methods for single-base substitution analysis, this method does not need specialized equipments, and opens up a new possibility of point-of-care diagnosis for single-nucleotide polymorphisms.

マイクロチャネルを利用した微粒子分級法の開発

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Development of Particle Classification Method Using Microchannels

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Abstract

A size-dependent particle separation (classification) is one of the most important procedures in biochemical, environmental, or medical analyses and their applications. However, the smaller particle size or the smaller size difference makes the particle classification difficult. The Lab-on-a-Chip concept have encouraged the miniaturization of, various separation or selection methods for small particles, including polymer beads, cells, and macromolecules. Mmicrofluidic devices have a potential to facilitate rapid and precise particle manipulation, due to accurately fabricated structures close to particle sizes, in micrometer or sub-micrometer dimensions. In this paper, the newly developed methods, pinched flow fractionation and hydrodynamic filtration, were introduced for continuous and hydrodynamic particle separation in microfluidic devices without the help of outer fields. In these methods, the hydrodynamics of laminar flow is utilized in a microchannel network, not necessitating any outer field controls.