

化学とマイクロ・ナノシステム

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光マイクロマシン：集積型センサと可変デバイス

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Optical MEMS for integrated sensors and tunable devices

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Abstract

Three-dimensional Si micromachining for the fabrication of optical components and optical systems are studied. The optical components such as micro-mirror, micro-lens, and micro light source were fabricated. Combining with micro-actuators, the optical devices can be made variable. A tunable grating was fabricated for spectroscopic study. The integrated optical devices such as optical scanner and near-field micro-probe are also shown. In those devices, some optical components are integrated on a Si micro optical bench.

Keywords: Micro system, Micro machining, Micro Optics, Optical sensor, Silicon actuator

金属配列と金属駆動型分子運動をプログラムする

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Programming Metal Arrays and Metal-driven Molecular Motions

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Abstract

A common subject in our group is the quest for a general way of metal coordination-mediated supramolecular construction, discrete metal arrays, and metal-driven molecular motions with high degrees of control and efficiencies. Here we report multi-functional design of metal-ligands that can program multi-metal arrays and metal-driven molecular motions. For instance, artificial DNA, in which nucleobases are replaced by metal-ligands, allows the quantitative formation of discrete Cu^{2+} arrays inside the DNA. Furthermore, the combination of disk-shaped tris- and hexa(monodentate) ligands and Ag^+ ions produces molecular ball bearings in which the two disk-shaped ligands can relatively rotate through three-point ligand exchange and flip motions in a cooperative manner. This paper focuses on what is a key to molecular array programming.

Keywords: Metal complex, Metal array, Molecular motion, Artificial biomolecule, Molecular ball bearing

超微小溶液チャンバーを利用した1分子バイオアッセイ
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Ultra small reaction chamber array for single-biomolecule detections

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Abstract

Precise understanding of the biological functions requires tools of size comparable to the basic components of life. We report here the development of ultra-small reaction chamber array and its applications for biological assay. The chambers can enclose separately small particles like protein, or DNA molecule. By simply enclosing single enzyme molecules in chambers, the single-enzyme detection was achieved. When the rotary-motor protein, F₁-ATPase, was enclosed to manipulate reversely, the resultant extremely small amount of synthesized ATP was detected. Thus, it was proven that the ultra-small chamber can be a new strong tool for ultra-sensitive bioassay.

Keywords: F1-motor, magnetic tweezers, Micro-chamber, femtoliter, chemomechanical coupling,

[技術レポート]

全自動チップ型電気泳動装置 ; Agilent 5100 ALP

山本 晃

横河アナリティカルシステムズ株式会社

A Fully Automated Electrophoretic analysis utilizing microfluidics instrument; Agilent 5100 ALP

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Abstract

In this paper, a new microfluidic instrument which make people possible to do electrophoretic analysis of biopolymers, DNA and Protein, in High throughput and fully automated fashion is described. It can analyze over thousand samples a day without any personnel. And its capability to flag certain sample wells which meet pre-defined rule may make all process including determination of the result, automatic.

Keywords: microfluidics ; high throughput; automatic analysis; electrophoresis

Micro Total Analysis Systems 2004 (μ TAS 2004) 報告

8th International Conference on Miniaturized Systems for Chemistry and Life Sciences

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1. はじめに

MEMS 分野と化学・バイオの接点として位置付けられる Micro Total Analysis Systems (μ TAS) 国際会議が、はじめてオランダのトゥエンテ大学で開催されてからちょうど今年で 10 年目を迎えた。当初隔年開催で始まり、2001 年より毎年開催となって、米国・欧州・アジアの 3 領域で開催され、今回 8 回目の会議 (μ TAS 2004; 8th International Conference on Miniaturized Systems for Chemistry and Life Sciences) となった。今年は 2004 年 9 月 26~30 日に、コペンハーゲンから近年建設された Oresund 橋を渡って電車で約 30 分に位置するスウェーデンのマルメで開催された。