A Portable High-speed DNA Analysis Device

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A micromachined fluorescence detector has been developed in which an optical interference filter is monolithically integrated and patterned on an amorphous silicon photodiode. The detector can be combined with an excitation light source and the limit of detection is as low as 7 nM of fluorescein concentration. We have also succeeded in the separation and detection of DNA fragments with a high speed, a high sensitivity and a high separation efficiency, using a compact device combining the micromachined fluorescence detector and a microfluidic electrophoresis chip (Figure). This technology will constitute a basic platform to realize compact diagnostic devices, enabling high-speed point-of-care analysis of DNA, RNA, proteins, saccharide chains, etc.

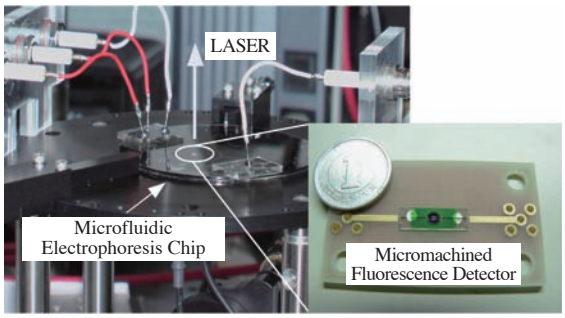

Figure : A portable high-speed DNA analysis device incorporating the micro fluorescence detector.

Massive Synthesis of Organic Nanotubes

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We have newly designed and synthesized amphiphilic molecules, and have developed a technique for the synthesis of various organic nanotubes of 40-200 nm in inner diameter, 70-500 nm in outer diameter, and several to hundreds μm in length by self-assembling them in organic solvents. This method needs less than one thousandth of the solvent used by conventional methods, enabling mass-production of organic nanotubes (Figure). Since they have excellent dispersibility in water, unlike carbon nanotubes, and can encapsulate guest substances of over 10 nm in size, such as proteins and nucleic acids, they are expected to be applied in various fields such as medicine, health, and nanobio-technologies.

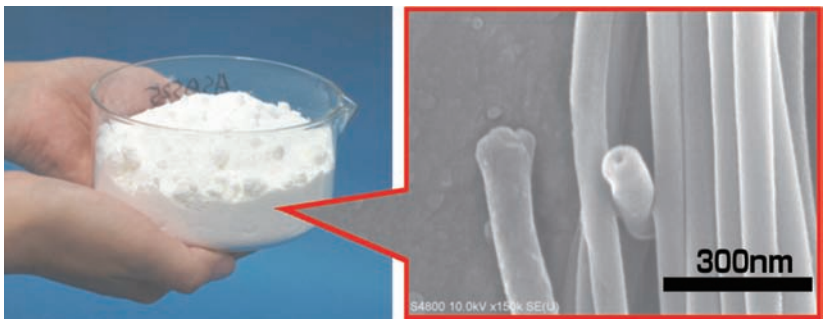

Figure : (Left) white powders (100g) consisting of organic nanotubes (mean outer diameter : 80nm, and mean inner diameter : 60nm), and (right) a scanning electron micrograph of the organic nanotubes.