

Magnetic Microfluidics and Miniaturized Magnetic Encoding of Biological Moieties for High-throughput Multiplexed Molecular Analysis

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Convergence between nanotechnology and biotechnology in the last decade has led to interest in the development of miniaturized high-throughput / high-contents screening (HTS, HCS) system for the detection of DNA, protein, cell, virus etc. Therefore a large variety of bioassay/biosensor technologies are either in development or being commercialized and numerous advancements continue to be made in biochip research that enable novel platforms to be developed for new applications. Among the various emerging bioassay technologies, magnetic bioassays, which utilize the high resolution magnetic sensor for the detection of biomolecules, are now attracting much interest because of their unique advantages such as ultrahigh sensitivity, selectivity etc. In this talk, a novel encoding and decoding scheme of micrometer-sized multibit magnetic tags which enables a specific signature to be encoded on each label and magnetic microfluidics for performing multiplexed high-throughput bioassays will be introduced. The method is based on the development of digital magnetic encoding techniques that utilize an ensemble of micron-sized ferromagnetic elements. It has far reaching implications related to the development of advanced systems for ultrahigh throughput biological assays that can be used in clinical diagnostics, drug discovery and genome sequencing, etc.