Method and Device for Producing Spectrally Encoded Microbeads for Use in Multiplexed Diagnostics or Research Assays

Tech ID: 22827 / UC Case 2012-153-0

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OTHER INFORMATION

KEYWORDS

fluorescent beads, barcode,

multiplex assays

CATEGORIZED AS

- **Imaging**
  - Other
- **Materials & Chemicals**
  - Polymers
- **Research Tools**
  - Reagents
- **Engineering**
  - Other
  - Robotics and Automation

RELATED CASES

2012-153-0

BACKGROUND

Multiplex assays are extremely useful in biomedical research for producing genomic and proteomic data. The ability to translate novel biomarkers for various diseases into new diagnostic multiplex assays is highly attractive from a drug discovery point of view. However, the actual execution of creating such high-throughput multiplex assays remains challenging, as they require the ability to reliably track the identity and location of individual probes throughout an experiment. One way of accomplishing this is by using encoded beads, where uniquely identifiable beads are attached to each individual probe. Spectral encoding is a popular method of encoding beads and involves mixtures of luminescent materials that emit light at different wavelengths in order to generate distinguishable output signatures. Typically, however, this approach is limited by low photostability and small numbers of usable unique codes. In order to accelerate the discovery of new biomarkers for drug discovery purposes, there is a need for a more efficient and cost-effective method of creating encoded beads for high-throughput multiplex assays.

TECHNOLOGY DESCRIPTION

UCSF investigators have developed a low-cost, highly efficient device and method for making luminescent microbeads that can be used in multiplexed diagnostics or research assays. The spectrally encoded fluorescent beads contain multiple nanophosphors, which have many advantages over the organic dyes used in the commercially available Luminex® bead system. The nanophosphors have high photostability and are less prone to bleaching, chemical, or oxidative damage to their emission characteristics over time. The beads are generated using an automated microfluidic device that mixes predetermined ratios of nanophosphors suspended in monomer, followed by photopolymerization. The resulting beads are uniquely identifiable and can be distinguished from each other with a low error rate (less than 0.1%). Additionally, the technology can be extended to a large number of codes, in the range of 10^6 - 10^7 spectral barcodes (compared to the 500 unique codes offered by Luminex), which could pave the way as a new platform technology for high-throughput multiplex assays.

ADVANTAGES

- Potential to create billions of spectrally encoded fluorescent beads for use as “barcodes” in multiplex assays.
- Low error rate (< 0.1%) associated with distinguishing between individual codes. The advantages of bead-based, multiplex assays are manifold, including:
- Faster reaction kinetics
- Increased assay flexibility
- Improved reproducibility
- Decreased costs

RELATED MATERIALS

▶ Gerver RE, Gomez-Sjoberg R, Baxter BC, Thorn KS, Fordyce PM, Diaz-Botia CA, Helms BA, and DeRisi JL. Programmable Microfluidic Synthesis of Spectrally Encoded Microspheres. Lab on a Chip. 2012. Advanced Article. DOI: 10.1039/C2LC40699C - 09/25/2012

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,241,045	03/26/2019	2012-153

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