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(54) **AGGREGATION INDUCED EMISSION ACTIVE CYTOPHILIC FLUORESCENT BIOPROBES FOR LONG-TERM CELL TRACKING**

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(58) **Field of Classification Search**
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See application file for complete search history.

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(56) **References Cited**

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U.S. PATENT DOCUMENTS

5,362,628 A 11/1994 Haugland et al.

OTHER PUBLICATIONS

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Yu et al. *Sci. China Series B: Chemistry* (Jan. 2009) 52(1): 15-19.*
Chen et al. *Chem. Mater.* (2003) 15: 1535-1436.*
He et al. *J. Mater. Chem.* (2009) 19: 7347-7353.*
Yu et al. *Advanced Materials* (Aug. 2011; published online Jun. 14, 2011) 23: 3298-3302.*
Farrell, et al., "Effects of iron oxide incorporation for long term cell tracking on MSC differentiation in vitro and in vivo," *Biochemical and Biophysical Research Communications*, (2008), vol. 369, pp. 1076-1081.

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* cited by examiner

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(57) **ABSTRACT**

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Fluorescent bioprobes comprising luminogen formed nanoparticles comprising luminogens with aggregation-induced emission (AIE) properties, which can be used for long-term cell tracking. The luminogens are nonemissive in organic solution but become highly emissive when aggregated in aqueous solution. The fluorescent molecules can readily pass through cell membranes, stain only the cell cytoplasm, and form highly emissive nanoaggregates in aqueous media without any obvious cytotoxicity in the living cells. Furthermore, the molecules can be retained inside the cells without noticeable leakage to the outside. Therefore, these AIE-based compounds can be used as selective and cell-compatible fluorescent bioprobes for long-term live cell tracking and imaging.

Related U.S. Application Data

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14 Claims, 7 Drawing Sheets

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(52) **U.S. Cl.**

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