A Supramolecular Approach for Preparation of Size-Controllable Nanoparticles

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SUMMARY

UCLA scientists have developed a novel supramolecular approach for preparation of size-controlled nanoparticles. Supramolecular nanoparticles prepared by this method were used for diagnostic imaging, gene delivery, and delivery to immune cells.

BACKGROUND

Advances in nanotechnology over the last two decades have allowed for use of nanoparticles in therapeutic applications. A number of nanoparticles such as quantum dots, polymer-based nanoparticles, and gold nanoshells have successfully been used in pre-clinical studies, clinical trials or become commercial products. Despite advances in nanoparticle therapeutics, there is a need for developing novel synthetic approaches in order to produce new-generation nanoparticles, which exhibits significantly improved characteristics, including controllable sizes/morphologies, low toxicity, and *in-vivo* degradability.

INNOVATION

UCLA scientists have developed a supramolecular approach for the preparation of size-controllable nanoparticles from three specific molecular (nano) building blocks. This approach offers synthetic convenience, flexibility and modularity of the size and surface chemistry of the nanoparticle. Nanoparticles with controllable sizes between 30 and 350nm have been obtained. These nanoparticles can be used for the assembly of a wide range of nanostructured materials such as carbon nanotubes, graphite nanoplates, quantum dots, and organic/inorganic materials into well-defined larger nanostructures.

APPLICATIONS

Supramolecular nanoparticles assembled via this method have broad application, including targeted drug delivery, imaging diagnostics, chemo therapy, gene therapy, and immunotherapy.

ADVANTAGES

- This synthetic approach offers synthetic convenience, flexibility, and modularity to alter sizes and surface chemistry of the supramolecular nanoparticle.
- Unlike polymer-based nanoparticles production, this method offers ease of synthesis.
- This method confers low-toxicity, low-immunogenicity, non-pathogenicity, and *in-vivo* degradability to the resulting supramolecular nanoparticles.
- Assembly approach allows control of particle's surface charges, and chemistry for better serum stability and biological circulation.

STATE OF DEVELOPMENT

Nanoparticles assembled using the method developed were used for imaging of tumor and lymph node drainage, gene delivery, and delivery to immune cells. Incorporation of drug-grafted polymer into the nanoparticles for targeted drug delivery is underway.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,845,237	12/19/2017	2009-340
China	Issued Patent	ZL201080016338.6	01/21/2015	2009-340

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OTHER INFORMATION

KEYWORDS

Nanotechnology, drug delivery, imaging, PET imaging, supramolecular chemistry, biodistribution study

CATEGORIZED AS

- **Biotechnology**
  - Health
- **Materials & Chemicals**
  - Biological
- **Nanotechnology**
  - NanoBio

RELATED CASES

2009-340-0

Germany	Issued Patent	602010019704.2	10/22/2014	2009-340
France	Issued Patent	2401225	10/22/2014	2009-340
United Kingdom	Issued Patent	2401225	10/22/2014	2009-340

RELATED MATERIALS

- A supramolecular approach for preparation of size-controllable nanoparticles. Angew. Chem. 121, 4408-4412 (2009).

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Capture And Stimulated Release Of Circulating Tumor Cells On Polymer Grafted Silicon Nanostructures
- Very-Small-Nuclear Circulating Tumor Cell (vsnCTC) as a Diagnostic Biomarker of Visceral Metastasis in Advanced Prostate Cancer
- Phenotypic Profiling Of Hepatocellular Carcinoma Circulating Tumor Cells For Treatment Selection

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