

## **Layer-by-Layer Based Nanoparticles for Systemic Delivery Applications**

Technology #14680

### **Applications**

This invention offers improved Layer-by-Layer film architecture for better film stability and biodistribution of nanoparticles for drug delivery.

### **Problem Addressed**

Layer-by-Layer (LbL) based nanoparticles are promising new systems for use as drug delivery vehicles as many therapeutics and biologically relevant materials can be easily introduced into LbL films noncovalently and under physiological conditions, without significant alteration of their biological properties. Furthermore, LbL films offer spatial, temporal or active control over the release of therapeutics from the surfaces of macroscopic objects and have great versatility since their composition, surface chemistry and dimensions may be manipulated. However, LbL based nanoparticles have not been demonstrated for systemic delivery *in vivo* due to challenges in film stability and biodistribution. This invention has generated systemically deliverable LbL nanoparticles for cancer applications.

### **Technology**

In this technology, biodegradable and biocompatible films were constructed using gold nanoparticle and quantum dot core templates and accumulation was measured in mice livers. It was discovered that the stability of nanofilms increases with more bilayers since LbL films are held together by ionic interactions between interpenetrated LbL layers. It was also observed that the terminal layer of the LbL nanoparticles plays a vital role in the biodistribution of the LbL particles and affects non-specific uptake. Hyaluronic acid outer layers, provide a long circulation half-life and much lower accumulation in the liver and kidney. This outer layer proves the viability of this system for cancer delivery as the circulation times of LbL nanoparticles were extended to levels sufficient for passive targeting to solid tumors via EPR.

### **Advantages**

- Improved film stability allowing for improved biodistribution
- Systemic delivery of a variety of different therapeutics or biologically relevant materials under physiological conditions
- Different film architectures allows for tailored circulation half-life and biodistribution for more effective treatments

### **Categories For This Invention:**

Life Sciences

---

Biomaterials

Micro/nanoparticles (Biomaterials)

Biotechnology

Health

Clinical Applications

Oncology

Therapeutics

Drug Delivery

## **Intellectual Property:**

Stable layer-by-layer coated particles

Issued US Patent

## **Inventors:**

Paula Hammond-Cunningham

Zhiyong Poon

## **Publications:**

Controlling in vivo Stability and Biodistribution in Electrostatically Assembled Nanoparticles for Systemic Delivery

American Chemical Society

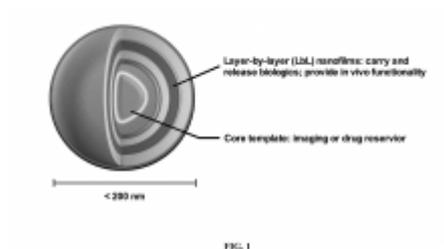
May, 2011

## **External Links:**

The Hammond Lab

<https://hammondlab.mit.edu/>

## **Image Gallery:**



---

255 Main Street, room NE 18-501

Cambridge, MA 02142-1601

Phone: 617-253-6966 Fax: 617-258-6790

<http://tlo.mit.edu>

Contact the Technology Manager: [tlo-inquiries@mit.edu](mailto:tlo-inquiries@mit.edu)