Patent Review

Recent Patent Publications in the field of Nanotoxicology and Nanomedicine

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Recent patents for 2015-2017 years on the application of nanomaterials in industry and medicine are shown below, Table 1. In this table a summary of these patents, their titles and year of publication is given.

Table 1. Recent patents on the application of nanomaterials or nanotechnology in industry and medicine

#Patent	Title/Abstract	Year of publication	Reference
US20170290916A1	Title: Materials and Methods for the Delivery of a Nanocarrier to the Brain. Abstract: Materials and methods for magnetically guided delivery of nanoparticles across the blood brain barrier (BBB) in the central nervous system (CNS) are provided. The method can comprise injecting a subject with an aqueous solution comprising magneto-electro nanoparticles and applying a static magnetic field directed toward the subject brain, thereby inducing a stimulus response of the nanoparticles in a controlled manner. Materials and methods provided herein are effective in delivering the nanoparticles across the BBB in the brains of animal subjects including mice and non-human primate such as baboon.	2017	(Kaushik and Nair, 2017)
US20170285020A1	Title: Anti-Fouling Siloxane Polymers and Uses Related Thereto Abstract: This disclosure relates to polymer coatings with desirable anti-fouling properties. In certain embodiments, polymers are coated on particles which allow for conjugation with targeting moieties. In certain embodiments, the particles are nanoparticles with targeting moieties that bind with tumor associated antigens.	2016	(Mao, Li, and Yang, 2016)
US20170273775A1	Title: Complex braided scaffolds for improved tissue regeneration Abstract: Implantable medical devices and prosthesis for rapid regeneration and replacement of tissues, and methods of making and using the devices, are described. The medical devices include a complex three-dimensional braided scaffold with a polymer composition and structure tailored to desired degradation profiles and mechanical properties. The composite three-dimensional braided scaffolds are braided from yarn bundles of biodegradable and bioresorbable polymeric fibers and/or filaments. Monofilament fibers and/or multifilament fibers can be twisted/plied in different combinations to form multifilament yarns, composite multifilament yarns, or composite yarns. The medical devices are useful as both structural prosthetics taking on the function of the tissue as it regenerates and as in vivo scaffolds for cell attachment and ingrowth	2016	(Rocco, Peterson, and Reilly, 2016)
US20170269095A1	Title: Nanoparticle probes and methods of making and use thereof Abstract: Some embodiments relate to nanoparticle probes for the detection of disease states in a patient or for tissue engineering. In some embodiments, the nanoparticle probe comprises one or more slip bonds that bind to a cell surface structure. In some embodiments, the binding of the nanoparticle probe is selective. In some embodiments, the nanoparticle probe binds to cells having a certain maximum glycocalyx thickness.	2016	(Lee, 2016)
US20170266317A1	Title: Synthetically Functionalized Living Cells for Targeted Drug Delivery Abstract: Uniform, functional polymer patches can be attached to a fraction of the surface area of living individual cells. These surface-modified cells can cross the blood-brain barrier while remaining viable after attachment of the functional patch. Functional payloads carried by the patch can include a drug. The patch can include one or more polyelectrolyte multilayers (PEMs).	2016	(Polak et al., 2016)
US20170252413A1	Title: Nano-scale delivery device and uses thereof Abstract: Disclosed is a delivery device for delivering a payload, including a biological, chemical or biochemical substance, to a subject. The delivery device has a nanoparticle loaded with the payload, and porous coating structure over the loaded nanoparticle to prevent the payload from escaping the delivery device, while also preserving the activity of the payload and increasing effective utilization of the payload. Also disclosed is a delivery device for delivering a payload, including a natural virus, recombinant virus, or engineered virus. Also disclosed is a delivery device that has a liposome loaded with the payload and a biocompatible surface coating over the loaded liposome. Also disclosed are methods of fabricating the delivery devices and methods of using the delivery devices in treating health conditions, such as cancer, or in diagnostic applications.	2016	(Esener et al., 2016)
US20170254796A1	Title: Ultra Low Capacitance Glass Supported Dielectric Membranes For Macromolecular Analysis Abstract: Provided are suspended solid-state membranes on glass chips with improved capacitance. Also provided are related methods of fabricating and using the disclosed chips.	2017	(Balan and Drndic, 2017)
US20170119668A1	Title: Polymeric particles, method for cytosolic delivery of cargo, methods of making the particles Abstract: Embodiments of the present disclosure include particles, methods of making particles, methods of delivering an active agent using the particle, and the like.	2015	(Keselowsky et al., 2015)
US20170115275A1	Title: Engineered substrates for high-throughput generation of 3d models of tumor dormancy, relapse and micro-metastases for phenotype specific drug discovery and development Abstract: Methods to form a novel aminoglycoside based hydrogel for high-throughput generation of 3D dormant, relapsed and micro-metastatic tumor microenvironments are disclosed. In addition, methods of screening agents against tumor cells grown in the 3D environments disclosed herein that include, for example, screening of lead drugs and therapies for an effect on dormant, relapsed and/or micro-metastatic tumor cells.	2015	(Rege et al., 2015)

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Table 1. Continued

#Patent	Title/Abstract	Year of publication	Reference
US20170112910A1	Title: Protein nanoparticle linked with cancer specific epitope and composition for cancer immunotherapy comprising the same Abstract: The present invention relates to a protein nanoparticle having a surface on which a cancer-specific epitope is fused and expressed, a method for producing the same, and a composition for cancer immunotherapy containing the protein nanoparticle as an active ingredient, and more specifically, to a recombinant microorganism into which a vector in which a promoter, a gene of a human ferritin heavy chain protein, and a gene encoding the cancer-specific epitope are operably linked is introduced, a protein nanoparticle in which a cancer-specific epitope is fused and expressed on a surface of the human ferritin heavy chain protein, a method of producing the protein nanoparticle, and a composition for cancer immunotherapy including the protein nanoparticle as the active ingredient, wherein the cancer-specific epitope on the surface of the protein nanoparticle according to the present invention is able to be expressed with correct orientation and high density, and the composition for cancer immunotherapy including the protein nanoparticle as the active ingredient has significantly excellent cancer immunotherapeutic effect as compared to the existing nanoparticle-based composition.	2015	(Lee et al., 2015)
US20170056327A1	Title: Micro/nano composite drug delivery formulations and uses thereof Abstract: Disclosed are micro/nano composite drug delivery compositions for use in diagnosis, prophylaxis, treatment and/or amelioration of one or more symptoms of a mammalian disease, disorder, dysfunction, or abnormal condition. In illustrative embodiments, pharmaceutical formulations comprising these composites are provided that are useful in methods for targeting selected mammalian cells and tissues, particularly human lung tissue, and delivering one or more therapeutic agents, particularly in the treatment of human lung cancers, such as melanoma lung metastases.	2017	(Mi and Ferrari, 2017)
US20170112775A1	Title: Situ self-assembling pro-nanoparticle compositions and methods of preparation and use thereof Abstract: Pharmaceutical composition comprising a pharmaceutically acceptable oil phase, a surfactant, and a therapeutic agent are provided herein, wherein the composition is in the form of a pro-nanoparticle or a self-assembling nanoparticle. Additionally, these pharmaceutical compositions have high loading of the therapeutic agent. Also provided herein are methods of preparing the pharmaceutical compositions and methods using the compositions in the treatment of a patient.	2017	(Dong, 2017)
US20170224620A1	Title: Therapeutic nanoparticles having egfr ligands and methods of making and using same. Abstract: Provided herein in part is a therapeutic nanoparticle that includes a biocompatible polymer; a polymer—EGFR ligand conjugate, wherein the EGFR ligand is covalently bound directly or through a chemical linker to the polymer, and a therapeutic agent.	2017	(Zale, McDonnell, and Horhota, 2017)
US20170029782A1	Title: Devices and methods for separating particles Abstract: Devices for non-invasive, label-free separation of particles in liquid, including circulating tumors cells in blood, are provided. Embodiments of the disclosure provide for devices employing magnetic fluids and magnets for separation of circulating tumor cells from blood. Methods for separation of particles including circulating tumor cells are also provided.	2015	(Mao, Schroeder, and Zhao, 2015)
US9616022B1	Title: Nanodiamond compositions and their use for drug delivery Abstract: The subject invention provides materials and methods for treating diseases affecting the central nervous system (CNS) and/or other viral reservoir organs utilizing nanoscopic diamond particles, i.e., nanodiamonds (ND), loaded with therapeutic agents of interests. In one aspect, the subject invention provides a composition for treating a subject's brain and/or other organs acting as viral reservoirs, the composition comprising a plurality of ND particles measuring less than 10 nm in size, wherein the ND particles are loaded with at least one therapeutic agent of interest. In another aspect, the subject invention provides methods of treating disorders affecting the CNS such as, for example, the brain and other viral reservoir organs such as, for example, lymph nodes and gut-associated lymphoid tissues (GALT), utilizing the drug delivery system comprising a plurality of ND particles as provided herein.	2017	(Roy, Drozd, and Nair, 2017)

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