

NOVEL DELIVERY VEHICLE FOR CELL TRANSFECTION (BIRAD)

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The Problem

Nanoparticles can be manufactured with tunable size, shape and surface as well as biological activity. Their role as nanocarriers is well established. While many nanoparticles are stable as an aqueous colloid, ferro fluid, they maintain an insufficient active surface and are limited in their capacity for further modification or surface engineering.

The Solution

In this cutting-edge technology a stable nanoparticle has been designed. It is composed of a metal oxide (maghemite, Fe₂O₃) core particulate system and a shell made of cerium (III/IV) cations and complexes.

The Commercial Benefit

This novel design of the nanoparticles facilitate manipulation of nanoparticle parameters to create more efficient vehicles for cell transfection in vitro and drug formulations with improved performance in vivo together with strong contrast of MRI capabilities.

Market Potential

The global transfection reagent & equipment market is expected to reach USD 1,086 million by 2022. This anticipated growth in demand can be attributed to the growing need for protein production, biopharmaceutical development, and vaccine research and development; all of which rely heavily on cytological R&D and transfection.

Target Markets/Industries

Transfection reagent market and especially for hard to transfect cells including white blood cells
Biopharmaceutical industry
Multivalent imaging/transfection/ therapeutic markets

Intellectual Property

Magnetic Inorganic Iron oxide-based nanoparticles
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Team: Primary Inventors

Prof. Jean-Paul Lellouche

Prof. Jean-Paul (Moshe) Lellouche is the Head of the Department of Chemistry and the Nano Materials Center at the Institute of Nanotechnology and Advanced Materials (BINA).

Prof. Lellouche' s main research interests include the chemical design, surface engineering, fabrication, and characterization of a wide range of functional organic and inorganic nanomaterials for various energy, biomedicine, conductivity, mechanical/lubricant-improvement methodologies, and (bio) sensing-driven applications.

Lellouche has authored 149 peer-reviewed papers, 15 patents and 3 book chapters while attracting more than US\$ 6,581,000 in external grant funding.

Prof. Shulamit Michaeli

Prof. Michaeli is the Vice President for Research of Bar-Ilan University

She Investigates Trypanosomatids, parasites that infect millions worldwide, causing African Sleeping sickness, South American Chagas disease, and leishmaniasis; as well as sand-fly fever, which affects a band of countries from Portugal through India, including Israel

Prof. Michaeli acted as the Dean of the Mina and Everard Goodman Faculty of Life Sciences
She was the Founding Director of the Nano-Medicine Center at the Bar-Ilan Institute for

Nanotechnology and Advanced Materials (BINA)

Prof. Shulamit Michaeli published over a hundred articles in professional journals and books

Michaeli patented several prominent technologies and won numerous prestigious awards, including the Israeli Society of Microbiology Award and the Andrew Lewoff award from the French Academy of Sciences

Future Research

Development of optimal one unique step surface engineering of functional (polyOH, NH₂, COOH, mixed shells) MRI-enabling iron oxide based NPs.

Combinatorically engineered inorganic and organic NPs for optimal (i) DNA sensing hybridization, (ii) anti-parasitic (anti-Leishmania) bio-activity, (iii) anti-diabetic nanocarriers

Optimal development of highest strong T2 contrast biocompatible lanthanide cation/complex-doped iron oxide-based nanoparticles for hybrid MRI, anti-cancer photothermal/photodynamic and anti-bacterial therapies

Development of magnetic nanoparticles for toxic cation/metal oxide capture via appropriate surface engineering (water cleaning capabilities via Cs/UO₂ and more .. capture)

Innovative technology of surface engineering of nanodiamonds for a wide range of bioactivity-relating applications (drug delivery systems, cosmetic applications and bio-sensing capabilities - new patent registration)

The Opportunity

We invite Industrial companies to license our patent through a licensing agreement with sponsored research.

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