Magnetic carrier for efficient purification of biopolymers

Development status

Phase 2

Feasibility study. There is a realistic design of the technology and the initial tests in the laboratory are leading to the specification of the technology requirements and its capabilities.

IP protection status

Patent CZ305599 (granted Nov 18, 2015); WO2016015690 (Feb 4 2016); US Patent pending. New priority patent application PV 2018-43, Priority date: Jan 29, 2018

Partnering strategy

Collaboration, licensing, spin-off

Institution

UNIVERSITY OF PARDUBICE

University of Pardubice

Challenge

The common technique in the separation of recombinant His-tagged proteins IMAC has several drawbacks for example, insufficient purity of separated proteins, limited surface area of microspheres accessible for binding, gradual release of the carrier ions during separation, poor mechanical stability, and toxicity of the released metal ions. In recent years, several nanomaterials for immobilization or purification of His-tagged proteins were also introduced, all utilizing nickel or cobalt (or their oxides), which all are also toxic. Phosphoproteomics as the relatively new field of science focuses on studying these processes as well as quantifying the dynamic changes of phosphorylated proteins over the time to identify and describe the relationship of the regulation of phosphorylation with the pathogenesis and development of serious diseases.

Description

The production of highly pure biomolecules, for example, proteins, polypeptides, oligosaccharides, or nucleic acids, is a key requirement for their use in medicine and life sciences. In particular, they are widely used for in vivo applications, such as for the production of efficient and selective biopharmaceuticals, including targeted bioactive therapeutics, recombinant proteins, or vaccines. The development of suitable materials and purification methods for these biologically active compounds is an important topic in current biomedical research. The specificity of TiO2NTs@ Fe3O4NP, surmounted by their unique properties, may open new pathways for the isolation and identification of clinically important biomolecules and for a whole range of in vitro life science applications. We have developed the 1D TiO2 nanotubes which, when decorated with magnetite nanoparticles, seem to be a great candidate for purification of biomolecules usable in life science and in biomedicine, fulfilling all requirements as high specificity, high surface area, proper magnetic functionality, and regeneration by photocatalytic means. Presented technology characteristics:: - TiO2 nanotubes adjustable dimensions (length, diameter, wall thickness) - length ≈5µm, I.D. ≈230nm - surface modification (Fe3O4, Fe2O3, NiO….), magnetic oxides = easy handling, Fe3O4 nanoparticles size - Ø

8 nm - adjustable structure (amorphous, anatase, rutile) - defined diffusion path for the reaction species accessibility of interiors - pH stability - pH 1-12, stable in 5% trifluoroacetic acid and/or in organic solvent – such as acetonitrile. - recyclability - min. 4 times - chemical stability - all commonly used buffers and solvents - production in lab from 100 mg up to 1g per day, batch to batch high reproducibility, know how to up-scale - storage – dry or in water/organic solvent

Commercial opportunity

We are looking for the cooperation with a strong partner to accelerate this work and realize the upscale and commercialization. The partner should recognise the potential of material and have a clear intention to incorporate our solution into their product portfolio. In case of a serious commercial interest, we are prepared to provide more information and discuss the possibilities of a cooperation pursuant to the execution of a confidentiality and non-disclosure agreement. Our major goal is to transfer our how-know into a commercial product. We offer a unique technology and outstanding expertise.