SCO-Young Scientist Profile

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Details of research work carried out in S&T (*limit to 200 words*)

Monoclonal antibodies (mAb) are key components of revolutionary new disease immunotherapies and are also essential for diagnostics and imaging. Protein A resins are widely used to purify antibodies, but cost, separation efficiency, and stability are major issues in most of the commercial products. The increasing demand for an alternative, concerning monoclonal antibody (MAb) isolation and purification using affinity chromatography, has surge research to discover unprecedented and intriguing work, through nanotechnology and molecular imprinting. This work attempts on addressing such issues anent to affinity systems. Hence, my research work is mainly focused on developing a less expensive, stable nanoparticle that can isolate antibodies from human serum more effectively than any commercial product. This work describes of low-cost, reusable, stable protein A-like nanopockets on 200 nm core-shell silica-coated magnetic nanoparticles for antibody isolation. Mouse IgG_2a, a strong protein A binder, was used as template protein, first attaching it stem down onto the nanoparticle surface. Then, a thin polymer coating on the nanoparticles was formed, and finally removal of the mouse IgG_2a provided nanopockets on the core-shell nanoparticles that showed binding characteristics for antibodies remarkably similar to protein A.

Associated SCO-YSC Theme: *Biotechnology and Bio-engineering*

Statement of Innovation ***(Brief information on new innovative ideas including startup / entrepreneurs- limit to 150 words)***

Highly pure monoclonal antibodies are one of the most expensive and effective drugs in the modern medical science. The purification steps are expensive which often make the antibodies very costly. Herein, this innovation idea to develop completely material based magnetic materials could effectively isolate antibodies from a mixture easily. The reusable nature of the material further can reduce the cost of these valuable drugs and make it available for everyone. Additionally, these thin-polymer coated nanomaterials are very useful in extreme physical condition and can be stable for a wide range of pH. This research describes the first nanoparticles that isolate antibodies with high efficiency from serum with an IgG binding repertoire closely resembling Protein A, which is mostly used in biotechnology industry and thus can potentially replace very expensive single use affinity column.

Shanghai Cooperation Organization- 1st Young Scientists Conclave (SCO-YSC 2020)
A virtual event organsied in India at CSIR-IICT, Hyderabad
***Theme:* Shaping SCO-STI Partnership: Young Scientists Perspectives**

Major awards/ Achievements ***(Upto 3 awards)***

FEI-Graduate Fellowship from FEI-UCONN ($10000)

Excellence in Teaching Award by University of Connecticut, 2013

Possible collaboration with SCO countries ***(limit to 100 words)***

My research interest is to develop material-based prototype on nanoparticles for biological application. I use molecular imprinting techniques to mimic antibody-like biological binding sites using a thin-layer polymer. Some of the major advantages in this method are the stability, low-cost, and reusability. Depletion of (>95%) human serum albumin (HSA) from human serum (HS) is one of major steps in proteomics – which I would like with in future using molecular imprinting. I am very open to collaborate with research team from other countries like China and Russia to extent my research work and also learn new innovations in molecular imprinting field.

Key words ***(relevant to research work conducted as well as proposed innovation, 5-6 words)***

Molecular imprinting, Nanoparticles, Monoclonal antibody, affinity column, Protein separation