FCR 16

Office of the President
February 19, 2016

Members, Board of Trustees:

PATENT ASSIGNMENT REPORT

Recommendation: that the Board of Trustees accept the patent assignment report for the period October 1 – December 31, 2015.

Background: At its March 1997 meeting, the Board of Trustees authorized the University of Kentucky Research Foundation to conduct all future copyright and patent filings and prosecutions. Quarterly reports on patent and copyright applications are to be submitted to the Finance Committee of the Board.

Action taken: ☑ Approved ❑ Disapproved ❑ Other _____

PATENT ASSIGNMENTS
FOR THE PERIOD OCTOBER 1, 2015 TO DECEMBER 31, 2015

Patents

The following assignment on behalf of the Board of Trustees of the University of Kentucky Research Foundation has been executed:

1. **U.S. Patent Application Serial Number: 14/924,181**
Filed: October 27, 2015
Title: High Activity Mutants of Cocaine Esterase for Cocaine Hydrolysis
Inventors: Chang-Guo Zhan, Fang Zheng, and Lei Fang (Pharmaceutical Sciences)
Technical Description: This invention relates variants of cocaine esterase (CocE) with potential for treating cocaine overdose and addiction.
Summary: There is no anti-cocaine medication approved by the FDA. Bacterial cocaine esterase (CocE) has been recognized as the most effective natural enzyme for hydrolyzing the naturally occurring (-)-cocaine. A major obstacle to the application of CocE is the thermo-instability of wild-type CocE, with a half-life of only about 12 minutes at normal human body temperature. Some CocE mutants with an improved thermal stability have been successfully designed and discovered in recent studies, and they do not decrease, or slightly decrease, the catalytic efficiency of CocE against cocaine. One such mutant is T172R/G173Q, and it is currently in clinical trials. This invention disclose a new mutant of the T172R/G173Q enzyme, which not only has considerably extended the *in vitro* half-life at 37^{o}C but also significantly improved the catalytic efficiency against cocaine, thus making it a very promising compound for the treatment of cocaine overdose. The new mutant fully protected mice against a lethal dose of cocaine for at least three days. The compound also exhibits a 100-fold or mire increase in cocaine hydrolysis catalytic efficiency compared to the T172R/G173Q mutant.

2. **U.S. Patent Application Serial Number: 14/952,433**
Filed: November 25, 2015
Title: Nanogaps on Atomically Thin Materials as Non-volatile Read/Write Memory Devices
Inventors: Douglas Strachan, Abhishek Sundararajan, and Mathias Boland (Physics and Astronomy)
Technical Description: This invention relates to the presence of nanogaps on atomically thin materials that can show nonlinearly through local charge exchange and the effects of ballistic transport.
Summary: Reducing the size of devices is one of the driving paradigms of the nanoelectronics and semiconductor industries for significantly improving their performance and efficiencies. In addition, fast all-electronic nonvolatile memory devices and nonlinear devices are highly desirable for both speed and efficiency. This invention provides an ultra-short nanogap nonlinear device with a channel on the size scale of approximately 10 nm, or smaller, comprising of an atomically thin channel comprising either one or two additional gate electrodes. These devices can show both non-volatile memory and clear signatures of ballistic, non-scattering transport, which is important for high-speed applications. This invention also provides a method of formulating a non-volatile memory element.

3. **U.S. Patent Application Serial Number: 14/952,511**
Filed: November 25, 2015
Title: Integrated Multi-Terminal Devices Consisting of Carbon Nanotubes, Few-Layer Graphene Nanogaps and Few-Layer Graphene Nanoribbons Having Crystallographically Controlled Interfaces
Inventors: Douglas Strachan and David Hunley (Physics and Astronomy)
Technical Description: This invention relates generally to the presence of anatomically thin materials that have a common crystallographical alignment to commensurate nanogap electrodes and nanoribbons.
Summary: To effectively probe and control coherent transfer at nanoscale interfaces, there must be highly precise commensurate electrodes that maintain the exact same crystal orientation at both the in-going and out-going interfaces of nanostructures. Without nanostructures that achieve this high degree of order at their electrodes, the fundamental coherent scattering effects at their electrical interfaces will likely remain obscured. This invention provides highly ordered, atomically thin commensurate nanoscale electrodes that provide coherent electron transfer to another atomically thin material (denoted as the channel material). Increased electrical coupling can be provided by this common crystal orientation for specific states in the channel and the electrodes.

Specifically, this invention provides a multi-terminal device, comprising a substrate with an atomically thin source electrode and an atomically thin drain electrode both on a top surface thereof. The source electrode and the drain electrode are separated by a nanogap between 0.3 and 100 nm. The electrodes are crystallographically commensurate with each other, and at least one atomically thin channel material crystallographically aligned with at least one electrode bridges the nanogap to form a device architecture. In certain embodiments, the channel material is perpendicular to the nanogap, and in others, it bridges the nanogap in accordance with the lattice parameters of the electrode. The channel material is atomically thin in a basically 2D structure. Other variations are also disclosed.

4. **U.S. Patent Application Serial Number: 14/957,142**
Filed: December 2, 2015
Title: Static Multiple-Sample NMR Probe
Inventors: Eric Munson and Mathew Nethercott (Pharmaceutical Sciences)
Technical Description: This invention relates to nuclear magnetic resonance (NMR) probes, specifically a static NMR probe including a plurality of magic angle spinning (MAS) modules for analysis of multiple samples.
Summary: Pharmaceutical companies are increasingly turning to solid-state NMR (SSNMR) spectroscopy analysis, but drawbacks of the process include high cost ($600K to $5M) of machinery and low throughput. This invention allows simultaneous SSNMR analysis of multiple samples without requiring probe movement within the magnetic field during sample acquisition. This invention consists of a plurality of probe subunits, each configured for holding a sample. Each probe subunit comprises at least an MAS module, a radio-frequency (RF) coil, and an RF transmission line, which together define an RF circuit, but other components may be added and variations on the number of components are proposed. Each plurality of probe subunits is held in a self-contained conducting housing, which isolates the RF circuit of each subunit from other subunits.

Patent Activities
Fiscal year to date as of December 31, 2015

Number of Patent Applications	**5**
Number of Patents Issued	**15**
Patent Gross Revenue	**$5,123,522.19**