

FCR 13

Office of the President
June 16, 2017

Members, Board of Trustees:

PATENT ASSIGNMENT REPORT

Recommendation: that the Board of Trustees accept the patent assignment report for the period January 1 – March 31, 2017.

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 JANUARY 1, 2017, TO MARCH 31, 2017

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: 15/405,754**
Filed: January 13, 2017
Title: Low Temperature Liquid Metal Batteries for Energy Storage Applications
Inventors: Cameron A. Lippert and Kunlei Liu (Center for Applied Energy Research)
Technical Description: This invention relates generally to a low temperature liquid metal battery operating at about 300°C with a ZnCl₂:KCl eutectic electrolyte and coaxial, coplanar liquid tin and bismuth electrodes.
Summary: This invention provides a liquid metal battery (LMB) comprising a vessel holding a first electrode of liquid tin (Sn) and a second electrode of liquid bismuth (Bi). Both the first electrode and the second electrode are in contact with a eutectic electrolyte. The eutectic electrolyte may be ZnCl₂:KCl. The first electrode and the second electrode may be coaxial and coplanar. LMBs require a certain temperature in order to function properly. Where the electrodes are liquid Sn and liquid Bi, the opening temperature needs to be about 300°C. The present invention also includes energy storage facilities comprising the liquid metal battery described in this patent application. The energy storage facilities may include a source of energy generation, such as a solar cell and/or a wind turbine. The invention also provides methods of storing energy, featuring charging the LMB described herein. The methods further require an operating temperature of about 300°C.

2. **U.S. Patent Application Serial Number: 15/417,729**
Filed: January 27, 2017
Title: Water Processable N-Type Organic Semiconductor
Inventors: Ruben S. Riquelme, Matthew C. Weisenberger and Camila F. Gomez (Center for Applied Energy Research)
Technical Description: This invention relates generally to water-processable n-type semiconductors of polyvinylpyrrolidone (PVP) and carbon nanotubes (CNTs) dispersed in water, into which small amounts of poly(ethyleneimine) (PEI) are added.
Summary: This invention discloses a new and improved water-processable n-type organic semiconductor comprising an aqueous processed polyvinylpyrrolidone/multiwalled carbon nanotube/poly(ethyleneimine) composite (PVP/MWCNT/PEI composite). A method of using a PVP/MWCNT/PEI composite in n-type semiconductor applications is also disclosed. Thermoelectric power generator devices that scavenge waste heat and include a PVP/MWCNT/PEI composite based n-type semiconductor are also envisioned. Thermoelectric Peltier (solid-state) cooling devices that include a PVP/MWCNT/PEI composite based n-type semiconductor are also envisioned. Also provided are methods for making the semiconductor that include steps of adding PVP, CNTs, and PEI to a container holding water to form a mixture, mixing the mixture and applying the mixture to a surface to form a film. The mixture may be mixed by sonication. The mixture may be applied by spray coating, painting, or inkjet printing, and the applied mixture may then be dried.

3. **U.S. Patent Application Serial Number: 15/423,042**
Filed: February 2, 2017

Title: CO₂ Mass Transfer Enhancement of Aqueous Amine Solvents by Particle Additives
Inventors: Leland R. Widger, Guojie Qi, Kun Liu, Jonathan Bryant, Cameron A. Lippert, and Kunlei Liu (Center for Applied Energy Research)

Technical Description: This invention relates generally to particle additives in CO₂ amine scrubbing solutions and the enhanced CO₂ capture provided by such.

Summary: Aqueous amine based post-combustion CO₂ capture is one of the most commonly employed practices for CO₂ removal from coal-fired combustion power plants. Extensive efforts have been carried out to seek or develop new amine solvents with the goal of improving CO₂ absorption efficiency with lower energy costs. Extensive studies have identified solvent improvement as a key point of the energy saving target. This invention provides methods for increasing carbon capture from a gas. The methods include contacting the gas with a biphasic scrubbing solution, which comprises an amine solvent with particles suspended therein. The invention discloses various embodiments of the type and size of the particles and the choice of amine solvent.

4. **U.S. Patent Application Serial Number: 15/429,523**

Filed: February 10, 2017

Title: Method of Development and Use of Catalyst-Functionalized Catalytic Particles to Increase the Mass Transfer Rate of Solvents Used in Acid Gas Cleanup

Inventors: Leland R. Widger, Cameron A. Lippert, and Kunlei Liu (Center for Applied Energy Research)

Technical Description: This invention relates generally to methods of carbon capture using entrained catalytic-particles in liquid solvents.

Summary: The application of CO₂ capture to post-combustion flue gas separation has recently been a major area of concern. In the long term, it is thought that this technology will be critical to reducing emissions from fossil fuel combustion potentially responsible for climate change. This invention provides a biphasic scrubbing solution comprising an amine solvent with particles suspended therein, the particles having a surface-appended carbonic anhydrase mimic catalyst. Various embodiments of the particles' size and other physical properties are disclosed, as are variations on the types of materials used in the functionalized group used to append the particles. The invention also reveals compositions of materials that may be used as the amine solvent. Finally, the invention provides methods of improving carbon capture comprising utilizing the biphasic solution described in the patent application as a stripping agent in a carbon capture system.

5. **U.S. Patent Application Serial Number: 15/443,266**

Filed: February 27, 2017

Title: Methods of Predicting Obesity

Inventors: B. Mark Evers, Jing Li (Markey Cancer Center), Paul Dobner (UMASS), and Olle Melander (Lund University, Sweden)

Technical Description: This invention relates to a method of predicting increased risk of obesity in a non-obese subject.

Summary: This invention relates to a method of predicting increased risk of obesity in a non-obese subject by determining a level of neurotensin expression in a biological sample from the subject and comparing that amount to a control level, as an increased neurotensin level is predictive on an increased risk of becoming obese. A variation on this approach uses the phosphorylation level of AMPK as an indicator rather than neurotensin. The invention also discloses a method of detecting reduced intestinal fat absorption in a subject, comprising contacting a biological sample from the subject with a probe for neurotensin to

determine how the subject's level of neurotensin compares to the control level, with a decreased level being indicative of reduced intestinal fat absorption. The invention also discloses a method of preventing and/or treating obesity by administering an effective amount of an agent that inhibits neurotensin and discloses various embodiments of such an agent.

Patent Activities

Fiscal year to date as of March 31, 2017

Number of Patent Applications	10
Number of Patents Issued	33
Patent Gross Revenue	\$2,246,814