FCR 24

Office of the President
December 3, 2024

Members, Board of Trustees:

PATENT ASSIGNMENT REPORT

Recommendation: that the Board of Trustees accept the patent assignment report for the period July 1, 2024 to September 30, 2024.

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 July 1, 2024 TO September 30, 2024

Patents

The following assignments on behalf of the Board of Trustees of the University of Kentucky Research Foundation have been executed:

1. **U.S. Patent Application Number:** 18/760,475
UKRFID: 2731
Filed: July 1, 2024
Title: LIGNOCELLULOSIC BIOMASS PROCESSING UTILIZING HYDROPHOBIC DEEP EUTECTIC SOLVENTS
Inventors: Jian Shi and Yuxuan Zhang (College of Engineering)
Description and Application: The invention is a novel method to process lignocellulosic biomass. The novel process combines a lignocellulosic biomass with a non-toxic hydrophobic deep eutectic solvent and applies heat, separating lignocellulosic biomass into its lignin, cellulose and hemicellulose components to create feedstocks. These feedstocks can be used for biofuels and paper production. The global biofuel market is expected to reach $225 billion by 2028 with an expected compound annual growth rate (CAGR) of 6.2%.
License: N/A

2. **U.S. Patent Application Number:** 18/763,170
UKRFID: 2639
Filed: July 3, 2024
Title: ENRICHMENT OF IRON FROM BAUXITE WASTE IN CHEMICAL LOOPING COMBUSTION
Inventors: Neng Huang, Kunlei Liu, Xin Gao, Ayokunle Omosebi and Dimitrios Koumoulis (College of Engineering)
Description and Application: The invention is a novel method and apparatus to enrich iron from bauxite waste using chemical looping combustion (CLC). The method includes: (a) calcining particles of bauxite waste to form oxygen carrier particles, (b) subjecting the oxygen carrier particles to CLC at a temperature of about 950°C-1,050°C to produce energy and the enriched iron fines as a by-product from the oxygen carrier particles via natural attrition, and (c) collecting the enriched iron fines that are emitted from fluidized processes by

filtering. The global iron market is estimated to reach $423 billion by 2028.
License: NA

3. **U.S. Patent Application Number:** 18/775,558
UKRFID: 2409
Filed: July 17, 2024
Title: DETERMINING PROPERTIES OF LIQUIDS WITHIN A SEALED CONTAINER
Inventors: Michael Renfro (College of Engineering)
Description and Application: The invention is a novel system to optically measure properties of liquids and gases in a sealed container, such as liquid depth, trace chemicals and flavor components. This system is particularly useful in the distilling industry where alcoholic beverages are aged in a sealed barrel. The system can accurately measure the alcohol by volume and monitor the desired flavor profiles and characteristics. The global spirit market is expected to reach $44.7 billion by 2030 with an expected CAGR of 4.9%.
License: N/A

4. **U.S. Patent Application Number:** 18/729,967
UKRFID: 2599
Filed: July 18, 2024
Title: COMPOSITIONS, METHODS, AND DEVELOPMENT OF ARID4B INHIBITORS
Inventors: Samuel Awuah, Samuel Ofori (College of Arts and Sciences) and Mei-Yi Wu (George Washington University)
Description and Application: The invention includes novel classes of compounds that bind to chromo-barrel domain at AT-rich interactive domain 4B (ARID4B) to treat breast cancer. Large-scale genomic analyses of breast cancer datasets show that ARID4B is amplified in breast cancer. The novel compounds are derivatives of ARD150. The global market for breast cancer treatment was $31.9 billion in 2022 and it expected to reach $70.5 billion by 2030, with a CAGR of 10.4%.
License: N/A

5. **U.S. Patent Application Number:** 18/792,020
UKRFID: 2282
Filed: August 1, 2024
Title: METHOD OF TREATMENT WITH TRADIPITANT

Inventors: Sharon Walsh (College of Medicine)
Description and Application: The invention is a novel method to treat an individual experiencing an undesired consequence of opioid use by administering the NK-1 receptor antagonist, tradipitant. The opioid use disorder global market is expected to reach $7.5. billion by 2032 with an expected CAGR of 9.5%.
License: N/A

6. **U.S. Patent Application Number:** 18/835,864
UKRFID: 2771
Filed: August 2, 2024
Title: SMART COILS FOR AN ELECTRIC MOTOR
Inventors: Jiangbiao He (formerly College of Engineering), Behrooz Mirafzal and Fariba Feteh (Kansas State University)
Description and Application: The invention is a novel electric motor with adjustable speed controlled by a switched drive or inverter. The novel motor includes a rotor, stator winding, cable and motor controller. The rotor is configured to couple to a mechanical load. The stator winding includes an adaptive impedance circuit connected in parallel with an inductive coil. A wide-bandgap transistor is configured to close when an overvoltage is detected. The global electric motor market was $113 billion in 2021 and is expected to reach $182 billion by 2028, with a CAGR of 7%.
License: N/A

7. **U.S. Patent Application Number:** 18/802,247
UKRFID: 1935
Filed: August 13, 2024
Title: COMPOSITIONS AND METHODS FOR TREATING RETINAL DEGRADATION
Inventors: Jayakrishna Ambati, Benjamin Fowler and Kameshwari Ambati (formerly College of Medicine)
Description and Application: The inventions are methods to treat degradation of the retinal pigment epithelium (RPE) by administering compositions with a nucleoside and/or a nucleoside reverse transcriptase inhibitor (NRTI). Geographic atrophy, an advanced form of age-related macular degeneration, causes blindness in millions of people worldwide. There are no approved treatments, and it results from death of RPE cells. The inventive treatment to reduce RPE cell death includes: 1) inhibiting inflammasome activation 2) reducing

permeability of a cell 3) reducing the amount of mitochondrial reactive oxygen species in the cell and/or 4) inhibiting activation of at least one inflammasome in a subject's eye. The global pharmaceutical market for age-related macular degeneration is expected to reach $18.7 billion in 2028.
License: Exclusive License to Inflammasome Therapeutics, Inc.

8. **U.S. Patent Application Number:** 18/842,763
UKRFID: 2454
Filed: August 29, 2024
Title: PRINCIPLES OF OPERATION AND CONTROL OF OXIDIZER IN COUNTERCURRENT LEACHING CONFIGURATIONS
Inventors: Joshua Werner and Peijia Lin (College of Engineering)
Description and Application: The invention is a novel method to extract copper, gold and other elements of value from electronic waste (e-waste) materials and copper bearing products. The method broadly includes: (a) contacting the feed material with a lixiviant to leach the target metal, (b) providing a countercurrent flow in the leaching circuit, (c) determining a reagent consumption rate for each leaching vessel, and (d) recovering the target metal from the lixiviant. The global market for e-waste was $52 billion in 2021 and is expected to reach $145 billion by 2030, with an expected CAGR of 13.%.
License: Licensed to Neocycle Holdings, Inc.

9. **U.S. Patent Application Number:** 18/842,887
UKRFID: 2576
Filed: August 30, 2024
Title: END-SUBSTITUTED (HETERO) ACENES WITH PAIRWISE COUPLING IN CRYSTALLINE FORM FOR PURE SPIN POLARIZATION AND OPTICAL READOUT
Inventors: John Anthony, Karl Thorley (Center for Applied Energy Research), Emma Holland (formerly Center for Applied Energy Research), Brandon Rugg, Justin Johnson and Brain Fluegel (National Renewable Energy Laboratory)
Description and Application: The inventions are novel crystalline (hetero)acenes as pairs of oriented molecules that undergo singlet fission to generate spin-polarized triplet pairs with high emission efficiency at low temperature. These novel compounds are used in quantum computation and quantum sensing. The global market for

quantum computing is $866 million in 2023 and is expected to reach $4.4 billion by 2028, with an expected CAGR of 38%.
License: N/A

10. **U.S. Patent Application Number:** 18/889,177
UKRFID: 2712
Filed: September 18, 2024
Title: UNIQUE ANALOGS OF NATURAL LIGNANS USEFUL FOR TREATING TRIPLE NEGATIVE BREAST CANCER
Inventors: Bert Lynn and Samuel Awuah (College of Arts and Sciences)
Description and Application: The invention is a series of novel lignan analogs to treat triple negative breast cancer. The novel compounds have superior anticancer activity compared to machilin C/D. The global market for triple negative breast cancer treatment is expected to reach $11 billion in 2030 with a CAGR of 12.1%.
License: N/A

11. **U.S. Patent Application Number:** 18/849,112
UKRFID: 2645
Filed: September 20, 2024
Title: BONE BIOPSY ASSEMBLY WITH LOST MOTION RECEIVER
Inventors: Madhumathi Rao, Clay Larkin and Florence Lima (College of Medicine)
Description and Application: The invention is a novel bone biopsy needle designed to sample bone with minimal damage to microarchitecture and surrounding tissue. The novel needle is used in conjunction with a power tool to minimize the force required during the procedure. The global osteoporosis diagnostic market is approximately $455 million with an expected CAGR of 4.1%.
License: N/A

12. **International Application Number:** PCT/US2024/40816
UKRFID: 2668
Filed: August 2, 2024
Title: COMPOUNDS CONTAINING ORGANOMETALIC STABILIZED GOLD (III) MACROCYCLES
Inventors: Samual Awuah and Sailajah Gukathasan (College of Arts and Sciences)

Description and Application: The invention is a library of unique gold (III) complexes stabilized by a C-Au bond and bulky (R,R)-DACH-phenyl Trost ligand via strong σ donation. The compounds have shown the ability to treat cancer through modulating mitochondrial respiration and metabolism. The global cancer treatment market is expected to reach $285.9 billion by 2030 with a CAGR of 9.12%.
License: N/A

13. **International Application Number:** PCT/US2024/44517
UKRFID: 2805
Filed: August 29, 2024
Title: MULTI-DIMENSIONAL NANOPARTICLES
Inventors: Younsee Bae (College of Pharmacy) and Piotr Rychahou (College of Medicine)
Description and Application: The invention is a novel quaternary multi-dimensional nanoparticle (qMDNPs) for use in drug therapy including combination drug delivery. The novel qMDNPs improve efficiency and safety of therapeutic agents by modulating the entrapment and release of the agents in response to biochemical factors. The global drug delivery market is expected to reach $376.8 billion by 2027 with a CAGR of 6.5%.
License: N/A

14. **International Application Number:** PCT/US2024/48770
UKRFID: 2665
Filed: September 27, 2024
Title: CATALYTIC DECARBOXYLATION/DECARBONYLATION OF OLEAGINOUS FEEDS INCLUDING ROSIN ACIDS TO SUSTAINABLE AVIATION FUEL BLENDSTOCK
Inventors: Eduardo Santillan-Jimenez, Robert Bruce Pace and Chukwudalu Great Umenweke (Center for Applied Energy Research)
Description and Application: The invention is a novel system to upgrade oleaginous materials such as fats, oils and grease (FOG) in combination with rosin acids to produce a sustainable aviation fuel. The global market for sustainable aviation fuel is expected to reach $18.26 billion by 2032 with a CAGR of 57.5%.
License: N/A

15. **Foreign Application Number:** EP 23743882.5
UKRFID: 2599

Filed: August 16, 2024
Title: Title: COMPOSITIONS, METHODS, AND DEVELOPMENT OF ARID4B INHIBITORS
Inventors: Samuel Awuah, Samuel Ofori (College of Arts and Sciences) and Mei-Yi Wu (George Washington University)
Description and Application: The invention includes novel classes of compounds that bind to chromo-barrel domain at AT-rich interactive domain 4B (ARID4B) to treat breast cancer. Large-scale genomic analyses of breast cancer datasets show that ARID4B is amplified in breast cancer. The novel compounds are derivatives of ARD150. The global market for breast cancer treatment was $31.9 billion in 2022 and is expected to reach $70.5 billion by 2030, with a CAGR of 10.4%.
License: N/A

Patent Activities
Fiscal Year to Date as of September 30, 2024

Total FY2024-25					
	FY25Q1	FY25Q2	FY25Q3	FY25Q4	Total FY25
Invention Disclosures[i]	22	0	0	0	22
Full Patent Applications[ii]	15	0	0	0	15
Provisional Patent Applications[iii]	27	0	0	0	27
Patents Issued	9	0	0	0	9
License Income	$427,185.01	$0	$0	$0	$427,185.01
New Licenses and Options Executed	29	0	0	0	29
New UK Startups Formed	1	0	0	0	1

Patent Activities
FY2023-24

Total FY2023-24					
	FY24Q1	FY24Q2	FY24Q3	FY24Q4	Total FY24
Invention Disclosures	24	34	49	35	142
Full Patent Applications	22	16	14	20	72
Provisional Patent Applications	18	15	25	20	78
Patents Issued	11	13	8	11	43
License Income	$446,360.22	$3,380,740.08	$332,705.97	$186,954.53	$4,346,760.80
New Licenses and Options Executed	13	17	14	22	66
New UK Startups Formed	2	3	0	2	7

Patent Application Summary Table

Inventors	College(s)	Title	Brief description
Biomedical			
Sharon Walsh	College of Medicine	Method of treatment with tradipitant	A novel method to treat opioid use disorder.
Jayakrishna Ambati, Benjamin Fowler and Kameshwari Ambati	College of Medicine	Compositions and methods for treating retinal degradation	A novel treatment for age-related macular degeneration.
Madhumathi Rao, Clay Larkin and Florence Lima	College of Medicine	Bone biopsy assembly with lost motion receiver	A novel bone biopsy needle.
Younsee Bae and Piotr Rychahou	College of Pharmacy	Multi-dimensional nanoparticles	A novel nanoparticle for use in combination drug therapy.
Engineering			
Jian Shi and Yuxuan Zhang	College of Engineering	Lignocellulosic biomass processing utilizing hydrophobic deep eutectic solvents	A novel method to process lignocellulosic biomass for biofuels and paper production.

Inventors	College(s)	Title	Brief description
Neng Huang, Kunlei Liu, Xin Gao, Ayokunle Omosebi and Dimitrios Koumoulis	College of Engineering	Enrichment of iron from bauxite waste in chemical looping combustion	A novel method and apparatus to enrich iron from bauxite.
Michael Renfro	College of Engineering	Determining properties of liquids within a sealed container	A novel system for optically measuring properties of a liquid in a sealed container with application in the spirits industry.
Jiangiao He	College of Engineering	Smart coils for an electric motor	A novel electrical motor with adjustable speed control.
Joshua Werner and Peijia Lin	College of Engineering	Principles of operation and control of oxidizer in countercurrent leaching configurations	A novel method to extract copper, gold and other elements from electronic waste.
College of Arts and Sciences			
Samuel Awuah and Samuel Ofori	College of Arts and Sciences	Compositions, methods, and development of ARID4B inhibitors	Novel compounds to treat triple negative breast cancer.
Bert Lynn and Samuel Awuah	College of Arts and Sciences	Unique analogs of natural lignans useful for treating triple negative breast cancer	Novel lignan analogs to treat triple negative breast cancer.
Samuel Awuah and Sailajah Gukathasan	College of Arts and Sciences	Compounds containing organometallic stabilized gold (III) macrocycles	Novel gold (III) compounds to treat cancer.

Inventors	College(s)	Title	Brief description
Samuel Awuah and Samuel Ofori	College of Arts and Sciences	Compositions, methods, and development of ARID4B inhibitors	Novel compounds to treat triple negative breast cancer.
Center for Applied Energy Research			
John Anthony, Karl Thorley and Emma Holland	Center for Applied Energy Research	End-substituted (hetero) acenes with pairwise coupling in crystalline form for pure spin polarization and optical readout	Novel crystalline (hetero)acenes that generate spin-polarized triplet pairs with high emission efficiency for quantum computing.
Eduardo Santillan-Jimenez, Robert Bruce Pace and Chukwudalu Great Umenweke	Center for Applied Energy Research	Catalytic decarboxylation/ decarbonylation of oleginous feeds including rosin acids to sustainable aviation fuel blendstock	A novel system to manufacture sustainable aviation fuel.

[i] Invention disclosures include new technologies and intellectual property disclosed to the Office of Technology Commercialization (OTC) that do not fall under an existing technology number. This number captures the potential new intellectual property disclosed to OTC.

[ii] Full patent applications, as used by OTC, include nonprovisional patent application filings at the United States Patent and Trademark Office (USPTO), Patent Cooperation Treaty filings, and foreign patent application filings. These are technologies that are assigned to the University of Kentucky that OTC has identified to invest further into in an effort to obtain patent protection and are described in more detail in the patent assignment section above.

[iii] Provisional patent applications are legal documents filed at the USPTO that establish a filing date and protect the owner from anticipated publication of the technology, but do not mature into an issued patent unless the applicant files a full patent application within one year. Although owned by the University of Kentucky, the provisional patent applications are not included in the patent assignment descriptions as they will not mature into full patent applications without further action and investment.