

**FY12 OARS Funding Review
Summaries of Projects Recommended for Award**

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|---------------------------|---|--------------------------|--------------------|-------------------------|
| PI: Khalid Hossain | Project Title: Hydrogen Assisted Surface Cleaning and Passivation of Semiconductor Substrates for Heteroepitaxy | | | |
| AR12-040 | Organization: Amethyst Research Incorporated | | | |
| Rank: 1 | Type: Accelerated | | | |
| Funding | Year 1: \$100,000 | Year 2: \$200,000 | Year 3: \$0 | Total: \$300,000 |
| Match Source | Amethyst | | | |
| Research | <p>In microelectronics, most integrated circuits (ICs) are fabricated on silicon while the sensors are based mainly in compound semiconductors. However, integration of the functionality of both types of materials onto a common platform is required to produce ‘smart’ sensors for DoD applications, which are more functional and cheaper. The difficulty of such integration is mainly related to the preparation of silicon-based substrates for heteroepitaxy, i.e. thin-film growth of compounds onto silicon. To this end, Amethyst Research has devised an innovative method of UV-activated, hydrogen-assisted surface cleaning and passivation of silicon (and other growth substrates, e.g. germanium) to ensure that they are free of contamination and remain so prior to thin-film growth. Surface contamination plays an important role in the nucleation of defects in epilayers and must be rigorously controlled during growth. Amethyst Research will market this technology via an offering of a process tool for preparation of Si and Ge for heteroepitaxy. Also, the tool will be used internally for wafer cleaning and passivation of substrates prior to thin-film growth of HgCdTe, which is used in the fabrication of high-performance infrared sensors and focal plane arrays.</p> | | | |
| Economic Benefit | <p>Gross sale projections (including materials and process tools) are estimated to be \$2,000,000 at the 2.5 year mark after the end of the project. Based upon the single offering of HgCdTe films, revenues are projected to increase 15-20% within the targeted market, i.e. manufacturers of high-performance infrared focal-plane arrays. While applications for heteroepitaxy on Si are unlimited, it is difficult to estimate long-term revenues, especially in the low-end commodity marketplace, where its use will depend critically upon a cost/benefit analysis. While Amethyst’s activities within south-central Oklahoma will provide a number of employment opportunities within the community, it will also involve the transfer of highly-trained technicians and researchers into the area.</p> | | | |
| Sectors | Semiconductors | | | |

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| PI: Peter Muriana | Project Title: Antimicrobial Peptides Produced by Lactic Acid Bacteria for Inhibition of Pathogens | | | |
| AR12-049 | Organization: Oklahoma State University | | | |
| Rank: 2 | Type: Proof-of-Concept | | | |
| Funding | Year 1: \$45,000 | Year 2: \$45,000 | Year 3: \$0 | Total: \$90,000 |
| Match Source | OSU Foundation and departmental royalties | | | |
| Research | <p>Lactic acid bacteria (LAB) are generally recognized as safe for use in foods. Many LAB produce bacteriocins that have potential use as biopreservatives. The PI has established a practical method of grouping bacteriocins based on ‘mode-of-action’ using spontaneously derived bacteriocin resistant (Bac-R) variants as a susceptibility screen or indicator. Use of the derived Bac-R strain in a susceptibility screen can identify other bacteriocins still inhibitory to the Bac-R strain, thus having a different mode-of-action. When bacteriocins of different modes-of-action are applied in a mixture, a synergistic effect is observed whereby greater reductions are obtained than can be accounted for by the sum of individual bacteriocins. The PI has demonstrated that a “PCR bacteriocin primer array” encompassing most known bacteriocin genes can allow the identification of sequences of bacteriocin structural genes from uncharacterized Bac+ strains of LAB, helping to determine if they have already been characterized (published). The objectives of this project are to use these two processes, “mode-of-action screening” and “PCR primer array” to screen hundreds of bacteriocin-producing strains of LAB accumulated during 20 years of research in this area and isolate new bacteriocin-producing LAB in order to cover as many modes-of-action as possible which may contribute to the best combination of bacteriocins/strains targeting foodborne and clinical pathogens. The bacteriocin-producing cultures, or the bacteriocins themselves, will be used in food applications to control <i>Listeria monocytogenes</i>, <i>STEC E. coli</i> (O157:H7 & non-O157), <i>Salmonella</i> spp., <i>Staphylococcus aureus</i> and examine inhibitory activity against problem clinical organisms such as <i>S. aureus</i> (MRSA), <i>Enterococci</i> (VRE), <i>Propionibacterium acnes</i> (acne), and those involved in dental carries.</p> | | | |
| Economic Benefit | <p>The proposed research is an extension of prior work done by Dr. Stan Gilliland in conjunction with Nutrition Physiology Corp whereby microbial cultures were identified that are currently widely fed to feedlot cattle, helping to reduce acidosis and the incidence of <i>E. coli</i> O157:H7. The product is sold under the name 'Bovamine', generates several million dollars in revenue annually, and brings in \$600,000 per year in royalty fees to Oklahoma State University. This product is known as being the largest intellectual property income at OSU. Further analysis of additional strains using the molecular approaches identified in this proposal could lend to the identification of additional strains that may add to the current multi-strain mixture comprising the Bovamine product, resulting in even greater efficacy. Given recent outbreaks in the food industry with food products contaminated with <i>E. coli</i> O157:H7, <i>Salmonella</i>, <i>Listeria</i> and other pathogens, the successful application of these products as biopreservatives could result in reduction of deaths attributed to foodborne illness, in savings by food processors while applying a safe, natural ingredient produced by bacteria that are normally consumed at high levels as viable bacterial cultures in products such as yogurt. Breaking into the food processing market with similar products where foodborne illness problems have been recurring annually could result in multiples of dollar sales beyond those experienced with sales of bacterial cultures to the cattle industry. There are additional applications to these products, including clinical applications that may only require topical application without consumption (tooth paste, mouth wash, topical skin cream, etc.). Since there is no current industry in Oklahoma that could provide the cultures required for commercial applications, the successful implementation of this technology may not only result in additional royalty income to OSU, but may also result in the development of a startup company housed in Oklahoma to address the culture needs of NPC, resulting in additional jobs for Oklahoma and reduced 3rd party product procurement costs for NPC.</p> | | | |
| Sectors | Biotechnology | | | |

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| PI: Nick Materer | Project Title: Sensor for Hydrogen Peroxide and Peroxide-Based Explosives | | | |
| AR12-023 | Organization: XploSafe, LLC | | | |
| Rank: 3 | Type: Proof-of-Concept | | | |
| Funding | Year 1: \$45,000 | Year 2: \$45,000 | Year 3: \$0 | Total: \$90,000 |
| Match Source | XploSafe; Oklahoma Transportation Center's US DOT funds | | | |
| Research | <p>The goal of this project is to develop explosive sensors that are highly selective and sensitive for peroxide-based improvised explosives and the hydrogen peroxide that is used to manufacture them. The hydrogen peroxide detection capabilities would also be useful for monitoring workplaces such as hospitals and food preparation operations where hydrogen peroxide is used for sterilization. The sensors will take advantage of the dramatic color change of titania nanoparticles when exposed to peroxides. The extreme sensitivity and the highly specific nature of the reaction that leads to the color change suggest that devices that can detect very low concentrations of explosives with high selectivity can be fabricated. The specific target is an electronic area sensor that can detect improvised explosive vapors at a security checkpoint, in a room, in a piece of luggage, or from a roadside IED. The technical objectives of the research described herein will be to: (1) Prepare sensing films (2) Test the sensing films with hydrogen peroxide, TATP, and HMTD (3) Produce an electronic sensor to detect vapors from peroxide-based explosives and from aqueous hydrogen peroxide (4) Test of the sensor with hydrogen peroxide, TATP, and HMTD (5) Test the sensor with potential interferents.</p> | | | |
| Economic Benefit | <p>The area sensor will have widespread applications ranging from explosives detection for Homeland security to monitoring peroxide levels for employee protection in hospitals, industrial and manufacturing operations. XploSafe estimates the US market size for the new area sensor at 63,828 units per year for year-end 2011 growing at a rate of 4% for the next 5 years. At a price point of \$3,000 per unit the market potential is approximately \$191 million per year. Based upon market analysis and correspondence with bomb squads, XploSafe projects selling 25 new area sensor units in the first year after completion of the OARS project. The new area sensor will have a sustainable competitive advantage as it will not require any sample preparation and will not be limited to only detecting solids, liquids or vapors. XploSens area sensor is the only sensor that can be used as a handheld and standalone mounted unit when compared to currently available detectors used for explosives detection or gas monitoring at facilities. The gross sales of products at years 2, 5, and 10 after the end of the OARS project are estimated to be \$285,000, \$2.9 million and \$8.7 million. The team envisions that the workforce staff will be 5 in the first 2 years after the OARS project completion, growing to 18 after 5 years and 40 at ten years. The majority of the positions created as a result of this OARS project will be high-paying jobs employing chemical engineers, electronic technicians, chemists, and materials scientists.</p> | | | |
| Sectors | Sensors | | | |

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| PI: Muna Naash | Project Title: Nanoparticle-mediated Gene Transfer to Baboon's Macula | | | |
| AR12-048 | Organization: University of Oklahoma Health Sciences Center | | | |
| Rank: 4 | Type: Proof-of-Concept | | | |
| Funding | Year 1: \$45,000 | Year 2: \$45,000 | Year 3: \$0 | Total: \$90,000 |
| Match Source | Equipment | | | |
| Research | <p>DNA transport through the cell membrane is an essential step for gene therapy. However, membrane transport of DNA is an inefficient process and the mechanism(s) by which this process occurs is unclear. Although viral vectors are effective in gene therapy, limitations in the payload and immune response elicited by viral proteins pose major problems and, therefore, a need exists to develop efficient non-viral DNA delivery vehicles. Nanotechnology provides such a delivery system for DNA to the ocular tissues. Self-assembling nanoparticles (NPs) of DNA combined with custom-made modified polycations have delivered genes successfully to the eye, brain, and lung. The PI's team has shown that these NPs can successfully deliver reporter genes to almost all photoreceptors in mice. DNA NP delivery by an intravitreal route results in photoreceptor- and RPE-based transgene expression, indicating that the inner retinal membrane can be penetrated by the NP. The PI hypothesizes that the efficiency of deep retinal penetration following intravitreal NP dosing can be further improved by the NP formulation optimization program proposed in Aim #1, where NP shapes, size, and chemical composition will be carefully evaluated first in mice. Aim #2 will conduct research level studies in baboons. These studies will include gene expression assessments following intravitreal dosing, with specific goals to determine if intravitreal dosing effectively introduces transgene DNA expression in macular cones, and confirmation of transgene expression. The system is likely clinically viable and, if properly adapted, it may provide a vehicle for delivery of therapeutic genes to treat and prevent different forms of retinal diseases including AMD. If successful, this research objective may provide a novel, non-invasive way to introduce DNA into human cone photoreceptors, addressing a critically important, currently unmet need for the advancement of ocular gene therapy.</p> | | | |
| Economic Benefit | <p>The competitive advantage of this proposal's technology over other treatment strategies is sustained expression of endogenous 'beneficial' proteins that can inhibit proangiogenic factors such as VEGF (responsible for new blood vessel growth that are typical with AMD) or related engineered proteins. As demonstrated by recent successes with non-viral based gene delivery systems, the PI's DNA NPs are positioned to be a competitive alternative or complementary treatment strategy to the current standard of care for AMD. Positioning this work within Oklahoma's bioscience sector will make an important contribution to its continued growth as a hub of cutting-edge medical research.</p> | | | |
| Sectors | Nanotechnology | | | |

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| PI: Mark Nash | Project Title: Pelco Products Symbolite Project | | | |
| AR12-039 | Organization: Pelco Products, Inc. | | | |
| Rank: 5 | Type: Accelerated | | | |
| Funding | Year 1: \$97,000 | Year 2: \$100,000 | Year 3: \$0 | Total: \$197,000 |
| Match Source | Pelco Products | | | |
| Research | Pelco Products, Inc. is developing a new form of LED traffic signal that incorporates corresponding symbols and colors in the display of directional displays. The system, called a Symbolite, will also have the capability of issuing specialized signals and alerts to inform drivers of approaching police and emergency vehicles. The goal of the proposed project is the development and commercialization of the Symbolite within 36 months. | | | |
| Economic Benefit | The company may see substantial growth through the development of the Symbolite. With over 50 million traffic signals in the US and more than 300 million worldwide, developing this product into a worldwide standard for traffic control could have an incredible economic impact on Oklahoma. Pelco's overall goal is not just to bring the Symbolite to the production stage, but to become the new standard in traffic signal control devices. Pelco anticipates the creation of as many as 10 to 15 jobs two years after commercialization of the Symbolite and over \$400 million in gross sales within 10 years. | | | |
| Sectors | Transportation | | | |

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| PI: Daniel Fisher | Project Title: Optimally Controlled Air-Conditioning Equipment for Sustainable Building Systems | | | |
| AR12-043 | Organization: Oklahoma State University | | | |
| Rank: 6 | Type: Accelerated | | | |
| Funding | Year 1: \$99,385 | Year 2: \$95,995 | Year 3: \$98,683 | Total: \$294,063 |
| Match Source | AAON, Inc. | | | |
| Research | <p>Over the next decade, emerging building cooling technologies will play a significant role in achieving sustainable building systems. Building energy management systems (EMS) now make it possible to optimize both the process control algorithms for these devices and the supervisory control algorithm for the unit as a whole. The objective of this project is to develop and deploy optimal supervisory and process control algorithms in all of AAON's, a Tulsa-based HVAC manufacturer, equipment. To achieve these goals a simulation testbed will be developed that merges a detailed physics based building model with a detailed, physics based vapor compression system model. This will allow development of both process and predictive supervisory control schemes that take into account such factors as building thermal mass and changing weather. In order to develop control boards that will accommodate the new control schemes and in order to validate the performance of the new control algorithms, the simulation testbed will be interfaced with a modified AAON control panel to create a realistic controls testbed. This project will involve fundamental research in three areas: (1) The creation of a simulation that is suitable for both evaluating candidate predictive control algorithms for heat pump systems and for calculating the coefficients required in those algorithms will significantly advance the state-of-art of energy system simulation; (2) The creation of a full scale, production controls testbed will significantly advance the state of the art of HVAC packaged air-conditioner controls; and (3) The development of optimal predictive control algorithms for packaged air-conditioning equipment will also significantly advance the state of the art of supervisory control algorithms and high efficiency systems.</p> | | | |
| Economic Benefit | <p>The economic impact of the project is expected to be immediate and significant. New, optimal control panels are expected to be in production within three years. Within 5 years, optimal control panels will be available on all product lines. The economic impact of this significant technological edge on AAON's market share is expected to be dramatic. The proprietary nature of the control algorithms and the significant research effort that will be required to develop the algorithms ensures that AAON's competitors will not be able to react quickly to AAON's new technology. A 5% increase in market share worldwide is a realistic and achievable five year expectation. AAON market analysis indicates that the project will realistically result in the production of 50 additional units per day and 50 new manufacturing jobs in Oklahoma. According to the Oklahoma Employment Security Commission, each manufacturing job in Oklahoma generates approximately \$54,000 per year in direct and indirect economic return. Therefore, 50 new manufacturing jobs would be worth \$2.7 million per year. The overall expected \$13.5M, 5 year payback would leverage the requested OCAST investment by a factor of 45 to 1.</p> | | | |
| Sectors | Energy | | | |

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| PI: Danyang Chen | Project Title: A Therapeutic Antibody for Diabetic Retinopathy | | | |
| AR12-010 | Organization: Charlesson, LLC | | | |
| Rank: 7 | Type: Accelerated | | | |
| Funding | Year 1: \$94,862 | Year 2: \$94,941 | Year 3: \$110,020 | Total: \$299,823 |
| Match Source | Charlesson contract profits and tax credit | | | |
| Research | <p>Diabetic retinopathy (DR) is a common complication of diabetes and a leading cause of vision loss in the United States. There is no FDA-approved pharmacotherapy for DR. The current treatments are not effective in all DR patients. Therefore, there is a vital medical need to develop alternate therapies for the sight-threatening disease. We found that the Wnt pathway plays a pathogenic role in the development of diabetic retinopathy. There are at least 19 Wnt ligands, 10 Frizzled receptors but only two co-receptors, low-density lipoprotein receptor-related protein 5 and 6 (LRP5 & 6) which are cell surface receptors essential for the Wnt pathway activation. Thus, LRP6 becomes an attractive target for developing effective treatments of DR. Through the generating and screening a series of mouse monoclonal antibodies for the Wnt ligand-binding domain of human LRP6, one monoclonal antibody, mAb2F1, has been identified as a specific antibody against human LRP6. mAb2F1 specifically recognizes LRP6, effectively blocks the Wnt pathway activation, significantly inhibits Wnt-responsive gene expression and multiple important pathological processes of DR. These effects of mAb2F1 make it a promising drug candidate for treating DR. This project will transfer the research findings of mAb2F1 into clinical application. We have generated a humanized antibody (CLT-020) derived from mAb2F1. The affinity of CLT-020 is 35 fold greater than mAb2F1, suggesting CLT020 has more potent activity. In this project we will establish the efficacy, pharmacokinetic and safety profiles of CLT-020 toward an Investigational New Drug application. This project may offer an effective therapeutics and intervention option for improving the treatment of DR.</p> | | | |
| Economic Benefit | <p>This new therapy is attracting world-class commercial partners, and is also generating strong interest from leading venture capital funds and federal agencies to support the development of the promising new drug candidate. Charlesson and Oklahoma will benefit from the expected economic impacts in each period of this project. Such great economic impacts include a multiplier for federal and state grants, venture capital, milestone payments, first sale payments, outsourced R&D sales and/or product royalties. The total estimated economic impact of this project is 127.3MM. During this project and 2, 5, and 10 years after the end of this project, Charlesson will receive economic impacts of 1.7, 10, 13.2, and 102.4MM, employ 4, 15, 30 and 60 persons and generate 0.3, 1.5, 3.3 and 7.5MM in revenue, respectively. CLT-020 has potential market size approaching \$5.5 billion per year. If we succeed it will improve the quality of life for 7.7 million Americans who suffer from diabetic retinopathy and diabetic macular edema. CLT-020 also has potential for additional indications, perhaps in age-related macular degeneration, cancer, and other angiogenesis-associated disorders. Furthermore, Charlesson will be greatly developed and expanded, and plans to retain its global headquarters in Oklahoma City. The company's great economic impacts and growth will outpace every other drug discovery company in the Presbyterian Health Foundation Research Park, create new job opportunities and promote the economic growth of Oklahoma.</p> | | | |
| Sectors | Pharmaceuticals | | | |

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| PI: Evgueni Kadossov | Project Title: Explosive-Containing Porous Materials as Non-Detonable Training and Testing Aids | | | |
| AR12-024 | Organization: XploSafe, LLC | | | |
| Rank: 8 | Type: Accelerated | | | |
| Funding | Year 1: \$149,999 | Year 2: \$149,999 | Year 3: \$0 | Total: \$299,998 |
| Match Source | XploSafe | | | |
| Research | <p>Canines trained to detect explosives provide a first line of defense at airports, postal facilities and protect our military by detecting explosive materials. Best practices dictate that the canines are trained using actual explosives. However, utilizing actual explosives requires qualified personnel that are trained to handle explosive materials, making the training both manpower-intensive and costly. Thus, segregates can be used for some explosives, but are expensive and not available for threats. HMTD is one such explosive that is extremely sensitive to shock, friction, and heat; it even reacts with most common metals in a process that can lead to detonation. XploSafe has developed a solution utilizing mesoporous ceramic materials in which each pore hosts HMTD in a fashion that negates explosive hazards while ensuring the maintenance of a normal vapor pressure of HMTD. Since the mesoporous framework consists only of silica, this material is completely involatile under ambient conditions; there are no extraneous volatile materials that could interfere with training of explosive-sensing dogs. To expand this work to other explosives, the surfaces of mesoporous silica need to be chemically modified to control the molecular interactions between the host material and the explosive. Low vapor pressure explosives, such as TNT and RDX, require weaker interactions with the pore to provide an acceptable vapor pressure. In contrast, high vapor pressure materials such as the terrorists explosive TATP may require stronger bonding. By systematically varying the chemistry of the pores, guided by computational studies, the effective vapor pressure of various explosives, including TNT, RDX and TATP, within the pores can be adjusted to safely mimic the real material.</p> | | | |
| Economic Benefit | <p>XploSafe will expand the technology developed through DHS SBIR Phase I and current Phase II funding to develop a comprehensive portfolio of non-detonable, non-hazardous, explosives training aids for canines and testing/auditing of explosives detection security infrastructure and equipment. XploSafe's new training aids will be commercialized under the XploTrain brand name and will include a commercial explosive, several military explosives, and improvised explosives used by terrorists. XploSafe estimates the total US market potential at 4.6 million units per year for year-end 2011 at a growing rate of 5% for the next five years. At an average price of \$25.00/training aid the United States market potential is estimated at \$117 million per year. The value proposition of negating the safety hazard from using actual explosives, costs associated with training personnel for handling the current training aids (that contain actual explosives) and the economic cost per unit of the new product will attract quick adoption of the new training aids. Based upon market analysis and correspondence with local K-9 units, XploSafe projects selling 3,049 training aids at \$25.00/training aid by the end of Year 1 directly and with XploSafe's distributor of chemical safety products, Sigma-Aldrich. XploSafe's new XploTrain product line has a sustainable competitive advantage with regards to having the capability to exclusively produce traditional and improvised explosive training aids that safely generate the same vapor phase components as the real explosive. The gross sales of products at within 10 years of the end of the OARS project are estimated to be \$7.2 million and the team envisions the company's workforce to number 40 by that time. The majority of the positions created and sustained as a result of this OARS project will be high-paying jobs employing electrical engineers, chemical engineers, electronic technicians, chemists, and materials scientists.</p> | | | |
| Sectors | Homeland Security | | | |

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| PI: Jay Hanan | Project Title: Design and Development of Hybrid Composite Armor | | | |
| AR12-041 | Organization: MetCel, LLC | | | |
| Rank: 9 | Type: Accelerated | | | |
| Funding | Year 1: \$44,000 | Year 2: \$0 | Year 3: \$0 | Total: \$44,000 |
| Match Source | MetCel; DSM Dyneema | | | |
| Research | <p>A Hybrid Composite Armor (HCA) insert prototype for a level III National Institute of Justice (NIJ) 0101.06 ballistic vest standard has been designed and successfully tested by the PI and the Co-PIs. A significant design attribute of the HCA revealed through prior ballistic tests is blunt trauma reduction for the wearer through reduced back face deformation (BFD). Improved V50 is also a derived attribute of the current design. This project aims at building capabilities to develop an automated prototype for optimizing and finalizing design and materials of HCA. Automate production capabilities will also allow for testing HCA for level IV NIJ standards through series of procedures involving extensive FEA based testing and modifications along with in-field ballistic testing. The focus of the research effort extends from in-depth laboratory assessment of individual materials for their strength-to-weight ratio to in-house production. Through beta testing and product sampling of the HCA, the performance capabilities for the desired standard would be evaluated. Positive results from the previous stage would ensure product viability in commercial armor segment and further qualify it for the NIJ accreditation desired. The technologies developed in process will open avenues for implementing similar methods to devise products for similar applications like vehicle armor, the marine sector, the packaging industry, and the aerospace industry.</p> | | | |
| Economic Benefit | <p>The primary consumers of this product are US Navy and the US Army. One of the most immediate benefits of the project is the creation of jobs to manufacture the product, and perform maintenance, machine operation, and training. Immediate benefit from this proposal will allow new technology development in Oklahoma with huge potential to commercialize. If successful, MetCel will create more than 30 jobs to initiate its production and operation. Another benefit from this proposal is for future collaboration between other firms in Oklahoma along with some organizations outside of the state for continued improvement of technology with possibility for future invention. MetCel will seek to access other federal research grants which will allow the company to develop other relevant technologies in Oklahoma. MetCel will also bring revenue from other states by selling MetaRil to other states and potentially to other countries. The economic model of this venture is designed to have medium margin and high volume, taking into consideration armor industry requirements. The expected gross profit margin is 40%. EBIT at the end of year 5 is projected at \$3.8 million. The value of the business at this stage is estimated to be \$30.4 million (using a PE ratio of 8).</p> | | | |
| Sectors | Advanced Materials | | | |

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| PI: Sean Bauman | Project Title: Discovering Biomarkers for a Histoplasma POC Diagnostic | | | |
| AR12-074 | Organization: Immuno-Mycologics, Inc. | | | |
| Rank: 10 | Type: Proof-of-Concept | | | |
| Funding | Year 1: \$45,000 | Year 2: \$45,000 | Year 3: \$0 | Total: \$90,000 |
| Match Source | NIH STTR award; IMMY | | | |
| Research | <p>IMMY plans to develop the first point-of-care (POC) test system that will aid in the diagnosis of histoplasmosis, a disease caused by the fungus Histoplasma, which is found worldwide and is particularly harmful to HIV/AIDS patients. This project focuses on accomplishing the first task in the development of this diagnostic, which is to discover protein biomarkers distinct to Histoplasma. Current methods of diagnosing histoplasmosis do not adequately address a large segment of the market. The hypothesis of this project is that an immunoassay for point-of-care diagnosis of disseminated histoplasmosis in HIV/AIDS can be constructed that targets Histoplasma-specific protein biomarkers that are shed into serum and urine during infection. The first steps of developing such a diagnostic are the focus of this proposal. The first specific aim will generate an anti-Histoplasma scFv phage display library by panning against Histoplasma-infected mouse serum and urine. The second specific aim will utilize: (1) the anti-Histoplasma scFv library; (2) two-dimensional PAGE and Western blot analysis; and (3) mass spectrometry to identify potential diagnostic biomarkers.</p> | | | |
| Economic Benefit | <p>A point-of-care test system differs from other platforms of diagnostics in that it can be utilized by virtually all levels of health care providers with minimal training required. This ranges from high complexity reference laboratories to rural clinics in developing countries. The POC diagnostic will have considerable advantages over current diagnostics. For instance, it will be capable of generating results in a matter of minutes, and it will be much more affordable. There will be an increase of one full time laboratory technician as a direct result of this proposal, and throughout the development and commercialization of this diagnostic the company expects its workforce to increase. Within the next two years, IMMY will seek additional funding through an SBIR grant. These funds will be used to build the diagnostic and to verify its effectiveness through clinical trials. In the 2-5 years after this project it is expected that the diagnostic will have a CE mark and FDA approval. At this point, the PI estimates sales to be \$1-\$3 million per year. Penetrating the market will not be difficult because IMMY currently sells other diagnostics to potential buyers of this test.</p> | | | |
| Sectors | Medical | | | |

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| PI: Kelvin Self | Project Title: GeoFold, A Folded Coaxial Ground Coupled Heat Exchanger | | | |
| AR12-021 | Organization: The Charles Machine Works, Inc. | | | |
| Rank: 11 | Type: Proof-of-Concept | | | |
| Funding | Year 1: \$45,000 | Year 2: \$45,000 | Year 3: \$0 | Total: \$90,000 |
| Match Source | The Charles Machine Works | | | |
| Research | <p>This Proof-of-Concept project is designed to provide information to help determine the commercial potential of the GeoFold system. This will mostly be done by direct comparison of GeoFold ground coupled heat exchanger (GCHE) and other state of the art GCHEs in terms of installation difficulty, overall cost and thermal performance. A small scale GeoFold manufacturing process will be developed to produce limited quantities of GeoFold pipe for testing purposes. Results of this small scale production run will also be used to infer full production costs and determine the feasibility of producing GeoFold in large commercial quantities. To evaluate the performance of the GeoFold system in a real world application, a replicated set of GeoFold and other common GCHEs are to be installed in the ground in a randomized pattern using a concept Ditch Witch® vertical drill rig and other equipment. Preliminary plans include using 10 GeoFold, 10 single U-loop, and 10 double U-loop GCHE installations. Installation cost, time, effort, equipment and complication will be documented for each GCHE installation. Additional factors in the study include installing the GCHEs at two different depths of 200 and 300 feet, and using 2-3 qualities of thermal grout. In-situ thermal conductivity, a bore log profile, and soil and grout samples will be gathered and analyzed for representative boreholes. Each GCHE will be instrumented to record flow rate and temperature of the heat exchange fluid entering and exiting each specific GCHE. This temperature change and flow rate will be used to quantify the thermal performance of each specific GCHE. Additionally, some GCHE will be instrumented to record pressure drop and temperature profile along the length of the GCHE to better understand the technical workings of the various GCHE. Plans are to record most readings over an extended specific period of time and for different seasons of the year to infer total performance.</p> | | | |
| Economic Benefit | <p>Potential benefits of the GeoFold system include: substantially easier installation; less than 5% of the grout volume; and as much as 500% greater heat exchange potential between the ground and heat pump. GeoFold has the potential to result in substantially lower installation cost and increased thermal performance when compared to any other GCHE used today. Market information indicates that between 210,000 - 310,000 ground source heat pump systems are installed each year worldwide. The Charles Machine Works, Inc. (CMW) makes Ditch Witch® (DW) equipment in Perry, OK, which is sold worldwide to install most types of GCHEs. CMW projects expanding opportunities in this market. The GeoFold concept has substantial synergy with current DW sales. As a new type of product for CMW, GeoFold would potentially expand CMW's sales into completely new markets. This would require hiring of new employees to engineer, manufacture, market and sell the GeoFold system.</p> | | | |
| Sectors | Energy | | | |