Early Support from USF Research Grants Culminates into $1.2M in DARPA Funding for this Collaborative Group

TAMPA, Fla (April 30, 2012) The USF silicon carbide (SiC) group, led by Prof. Stephen E. Saddow in the Department of Electrical Engineering, has been pioneering the use of SiC as a biomedical material for advanced applications since 2005. Starting with early work aimed to resolve the controversy of whether or not SiC is biocompatible (C. Coletti, PhD dissertation 2007) and moving on to the vascular system where proof that the cubic-form of SiC is hemocompatible (N. Schettini, PhD dissertation 2009) it was shown that cubic SiC appears to be nearly ideal for neurons \textit{in vitro} (C. Frewin, PhD dissertation 2009). Based on this body of work an interdisciplinary team of researchers in the colleges of engineering (Saddow et al) and medicine (Weeber et al) was formed to further develop SiC for neural applications.

The group’s early work was supported by several internal grants – A BITT seed grant for the development of SiC for neural probe applications (2009-2010); an interdisciplinary research grant from the College of Engineering that was matched by the College of Medicine (2010) and, in 2011 the group received a Neuroscience Collaborative grant from President Genshaft to further develop this technology (2011-2012).

All of these initial grants that allowed this research to get started came from USF, which then enabled Dr. Frewin to win a highly competitive NIH Post Doctoral fellowship in 2011 (two year Ruth L. Kirschstein National Research Service Awards (NRSA). All of this positioned the group to win a prestigious two year grant of $1.2M from the Defense Advanced Projects Research Agency (DARPA) in late 2011. This highly interdisciplinary group is led by Professor Stephen E. Saddow, College of Engineering and by Dr. Edwin Weeber, College of Medicine, and is supporting two post doctoral researchers, two graduate students, a biotech and several REU students. The group’s external collaborator on this project is Dr. Joe Pancrazio of George Mason University, Fairfax, VA, former Program Director for neural engineering and the neural prosthesis program at the National Institutes of Health before joining GMU in 2009 to lead the biomedical engineering program within the electrical engineering department.

**Biocompatibility of Advanced Materials for Brain Machine Interfaces (BAMBI)**
The overall goal of this project is to establish and demonstrate a systematic process for testing novel materials for use in a new generation of reliable brain machine interfaces (BMIs). Biomaterial testing involves three fundamental phases: 1) \textit{in vitro} testing of the material with cell lines; 2) material
robustness and durability assessment; and 3) *in vivo* testing. For neural interfaces such as BMIs, developers of materials rarely use the accepted international standards for material testing and often disregard material robustness testing altogether. While the *in vivo* brain tissue response to implanted materials is currently an emerging field, there are well characterized aspects that can and should be quantified. This project will fill a critical gap in our ability to take full advantage of emerging materials by supplying this testing capability to the material development community and working cooperatively to bring new materials forward.

The group’s approach is novel since it will enable a translational bridge for exciting developments in material science to be rapidly considered for neural interface applications. The group will provide ready access to expertise in electrochemistry, material science, *in vitro* cellular assays, and immunohistochemistry to conduct consistent, rapid, and systematic assessments of novel materials. The project is directly related to DARPA’s interest in eliminating barriers to the clinical deployment of reliable neural technology where advances in materials would facilitate the potential of implanted neural interfaces to enhance the recovery of injured service members and assist them in returning to active duty. If successful, the team will rapidly assess candidate materials, determine their utility for central nervous system interface applications, and accelerate the introduction of promising materials into the next stage of BMI/Neural prosthetic device development.

The group’s future plans are to continue *in vitro* and *in vivo* research with the materials science and bioscience teams working to further develop silicon carbide biomaterials and biodevice technology for such important applications as neural prosthetics and brain-machine-interfaces (BMIs). They are hopeful that DARPA (which is currently supporting the development of neural probes and BMI technology at a level of $60M) and/or the National Institutes of Health will support this ongoing research with additional grants.

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