Published on ***Hawaii Natural Energy Institute*** (http://www.hnei.hawaii.edu)

National Science Foundation releases additional funding for HNEI?s Carbon Substitution and Sequestration project

The National Science Foundation (NSF) sponsored Carbon Substitution and Sequestration (CarbSS) project of the Hawaii Natural Energy Institute (HNEI) is designed to introduce University of Hawai?i (UH) engineering graduate students to the science of biomass carbonization and combustion, and the characterization of biocarbons through hands-on laboratory studies involving unique equipment housed in HNEI of UH and the Norwegian University of Science and Technology (NTNU).

With the continuing eager interest in this work expressed by NSF, nearly $30,000 has been added to existing funding, bringing the NSF total up to just under $300,000. Principal Investigator for this project is Michael J. Antal, Jr., [1]***Coral Industries Professor of Renewable Energy Resources***.

The following is a summary of the students? expected research activities:

- At UH the students will be trained in the operation of our laboratory Flash Carbonization (FC) reactor. After they become proficient with its operation, they will carbonize packed beds of various biomass feedstocks (e.g., sewage sludge, Pioneer Hi-bred corn cob residues, Norwegian GROT, etc.) in the FC equipment at elevated pressure using conditions that deliver high fixed-carbon yields of charcoal. These charcoals will be provided to our Norwegian colleagues and others as needed. We emphasize that ?designer? charcoals of this nature are not otherwise available for study. Dr. Antal?s laboratory is constantly receiving requests from researchers world-wide for our ?designer? charcoals.
- Also at UH the students will learn how to do proximate analysis (i.e. fixed-carbon, volatile matter, and ash content) of charcoals according to ASTM D1762-84 (Reapproved 1990): ?Standard Method for Chemical Analysis of Wood Charcoal?. Subsequently the students will do proximate analyses of all the charcoals produced in 1) above and use the results to calculate experimental fixed-carbon yields. In addition, the students will learn how to use a Quantachrome gas sorption analyzer to measure the surface areas and pore-volume distributions of their charcoals.
- During the summer at NTNU in Norway the students will master the use of the NTNU micro- and macro-TGA instruments, its SEM and XRD instruments, and/or its bench-scale biocarbon combustors. Subsequently, they will accomplish TGA studies of the combustion and high-temperature carbonization of various charcoals, and/or studies of the performance of biocarbons in small-scale combustors. The carbonized charcoals will be examined by SEM and XRD to determine their structure, and how high carbonization temperatures affect their composition and structure. Their results will be published as papers written by the students as part of their thesis

requirements. TGA instruments and combustors are not available in the USA for work of this nature.

Last Updated: Thursday, August 09, 2012

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Links:
[1] http://www.hnei.hawaii.edu/staff/michael-j-antal-jr