UNIVERSITY of
HOUSTON

Texas Center for Superconductivity
A Center for Research and Development
of Advanced Materials

July 16, 2015

Regarding Sustainability Innovation: **A new high power factor thermoelectric material**

To whom it may concern:

In the U. S., a large amount of the annual energy consumed is wasted, mostly in the form of heat. The effective recovery of waste heat will contribute greatly to enhance energy efficiency, reduce greenhouse gas emission, and promote sustainable development. Among the various approaches to recovering waste heat, thermoelectric devices that convert heat directly to electricity have shown great promise. These devices contain no mechanically moving parts and thus are noise-free and very stable for long term operation.

Our Innovation involves a new thermoelectric material, intended to generate electric power from waste heat with greater efficiency and higher output power than currently available materials. While the new material germanium-doped magnesium stannide has a fairly standard figure of merit, a key factor to determine efficiency, at 1.4, it has a very high peak power factor, at 55. For practical applications, high output power density is as important as efficiency when the capacity of the heat source is very large such as solar heat, or where the cost of the heat source is not a big factor as with waste heat from automobiles, or the steel and cement industry

The material was created through mechanical ball milling and direct current-induced hot pressing. It can be used with waste-heat applications and concentrated solar energy conversion at temperatures up to 300 degrees Centigrade, or about 572 degrees Fahrenheit. Applications could include use in a car exhaust system to convert heat into electricity to power the car's electric system, boosting mileage, or in a cement plant, capturing waste heat from a smokestack to power the plant's systems. We have formed a company called APower together with collaborators at MIT to commercialize the material for thermoelectric devices.

Sincerely,

Allan J. Jacobson
Robert A. Welch Chair of Science
Professor of Chemistry and Chemical Engineering
Director, Texas Center for Superconductivity

202 UH Science Center • Houston, TX 77204-5002
Office: 713.743.8200 • Fax: 713.743.8201 • www.tcsuh.uh.edu