

The Journal of the Acoustical Society of America

[SUBMIT YOUR ARTICLE](#)[HOME](#)[BROWSE](#)[INFO](#)[FOR AUTHORS](#)[!\[\]\(d3102649f02e825ddb76dc3de0190154_img.jpg\) SIGN UP FOR ALERTS](#)[COLLECTIONS](#)

[Home](#) > [The Journal of the Acoustical Society of America](#) > [Volume 151, Issue 4](#) > [10.1121/10.0011025](#)

[< PREV](#)[NEXT >](#)

Free • Published Online: 10 May 2022

Quiet power: Exploring the feasibility of a noise-mitigating, thermoacoustic energy harvester

The Journal of the Acoustical Society of America **151**, A179 (2022); <https://doi.org/10.1121/10.0011025>

Samarjith Biswas

• Oklahoma State Univ., 201 General Academic Bldg., Stillwater, OK 74078, samarjith.biswas@okstate.edu

James M. Manimala

• Oklahoma State Univ., Stillwater, OK

[View Contributors](#)





- Topics▼

- Topics ✓

- Porous media
 - Ceramics
 - Acoustical properties
 - Acoustic waveguides
 - Electrical properties and parameters
 - Thermoacoustics
 - Energy harvester

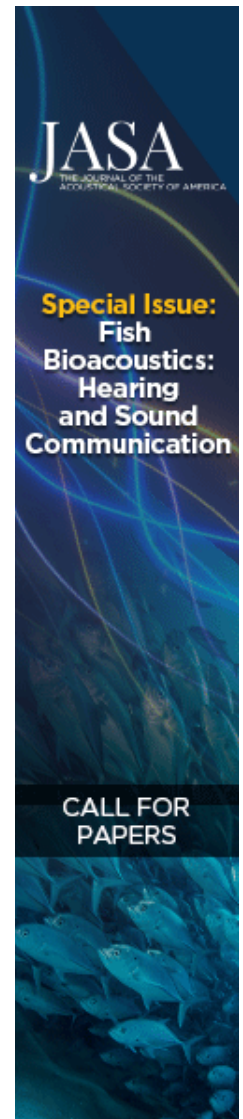


Meeting abstract. No PDF available.

ABSTRACT

The thermoacoustic effect provides a means to convert acoustic energy to heat and vice versa without the need for moving parts. This enables the realization of mechanically robust, noise mitigating energy harvesters, although there are limitations to the power-to-volume ratio achievable. The mechanical, thermal, and geometric properties of the porous stack that forms a set of acoustic waveguides in thermoacoustic devices are key to its performance. In this feasibility study, first, various 4-in. diameter ceramic and polymeric stack designs are evaluated using a custom-built thermoacoustic test rig. Influence of stack parameters such as material, length, location, porosity, and pore geometry are correlated to simulations using DeltaEC, a software tool based on Rott's linear approximation. An acousto-thermo-electric transduction scheme is employed to harvest useable electrical power using the best performing stack. Steady-state peak voltage generated was 33.5 mV for a temperature difference of 34 °C between the hot and cold sides of the stack at an acoustic excitation frequency of 117.5 Hz. Further

investigations are underway to establish structure-



performance relationships by extracting scaling laws for power-to-volume ratio and frequency-thermal gradient dependencies.

© 2022 Acoustical Society of America.



Resources

[AUTHOR](#)

[LIBRARIAN](#)

[ADVERTISER](#)

General Information

[ABOUT](#)

[CONTACT](#)

[HELP](#)

[PRIVACY POLICY](#)

[TERMS OF USE](#)

[FOLLOW AIP PUBLISHING:](#)



Website © 2022 AIP Publishing LLC.

Article copyright remains as specified within the article.

Scitation

