

ThermoBuild Brief

A Newsletter Featuring Leading Voices in Thermoelectrics and Building Energy Technology

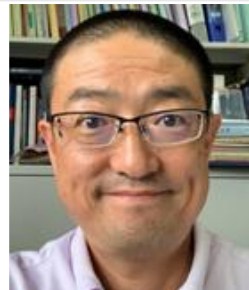
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Research Highlights

This research project aims to overcome challenges in the resource and energy utilization of agricultural residue biomass by developing a compact, decentralized, portable, and self-sustaining system that integrates a biomass burner with thermoelectric units.

While agricultural biomass has traditionally been used primarily as a source of heat, this project goes beyond conventional approaches. In addition to heat supply, the proposed system enables electricity generation and the production of carbon-based resources such as biochar, promising.

Expert Spotlight



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Technical Insight

- Thermoelectric power generation units were installed on a compact biomass burner. The units consist of various types of thermoelectric modules, heat collectors, and water jackets.
- To enable power generation and heat recovery over a wide temperature range—from low to high temperatures—a cascade configuration was adopted, combining thermoelectric modules made from different materials, including oxides, half-Heusler compounds, and bismuth tellurides. This design allows efficient utilization of thermal energy under varying operating conditions.



Data Snapshot

Energy and carbon cycling by combustion of agricultural residue, The 19th International Conference on Electronic Materials, June 28-July 1, 2026 <https://www.iumrs-icem2026.org/>

Trigeneration of heat, electricity and carbon by combustion of grain residue 11th International Congress on Ceramics, September 6–11, 2026 <https://www.ceramic.or.jp/icc11/>

Thermoelectric units were installed on a compact biomass burner to evaluate heat and power outputs from wheat residue combustion, with results on cogeneration performance and biochar production to be reported.

Up Next

"By integrating energy production with the generation of value-added carbon materials, this research aims to establish a new, high-profit circular system that enhances the economic viability of agricultural biomass utilization. This approach is expected to contribute not only to local energy self-sufficiency but also to sustainable resource circulation in agricultural regions."