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# Thermoelectric Properties of B-FeSi<sub>2</sub> Thermoelectric Module Utilizing Cast-Iron Scrap Chips

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Semiconducting  $\beta$ -FeSi<sub>2</sub> has been considered one of the most promising thermoelectric materials among numerous innovative thermoelectric materials due to its inexpensive cost and exceptional oxidation resistance up to 900°C. Thermoelectric generation modules consisting of pairs of p-type 0.94C.I.-0.06Co-1.86Si and n-type 0.92C.I.-0.08Mn-1.86Si have been fabricated using Cu sheets as electrodes and Ag paste as bonding material. In an experiment, the maximum power density is measured by using a variable resistor range of 10 Ω–10 kohm. Two different temperatures that are

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tested in this project are 40 and 60 °C. A rectangle and a trapezoid as the thermoelectric leg shape geometry are compared. The percentage difference for voltage is around 21% while the power shows a 41 and 65% difference depending on the temperature difference. The latter percentage difference is possessed by higher T. Based on the comparison with the reference, thermoelectric module from cast iron scrap chips was comparable and better than the reference. Trapezoid shows better geometry than rectangular shape in terms of thermoelectric power density. At 40 °C, the maximum power output are 21.89 and 21.91 μW whilst the maximum power for 60 °C are 28.13 μW and 28.42 μW for rectangle and trapezoid respectively. © 2023, The Author(s), under exclusive license to Springer Nature Singapore Pte Ltd.

#### Author keywords

Cast-iron scrap chips; Power density;  $\beta$ -FeSi<sub>2</sub> thermoelectric module

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