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# Preparation and Thermoelectric Properties of Pseudogap Intermetallic $(\text{Ti}_{1-x}\text{V}_x)\text{NiSi}$ Solid Solutions

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## Abstract

We theoretically and experimentally investigated the thermoelectric (TE) properties of TiNiSi-based solid solutions with a pseudogap at the Fermi level in the electronic band structure. Calculation of the TE properties of TiNiSi predicted that electron doping of TiNiSi leads to a higher power factor than hole doping. According to this prediction, we prepared the partially V-substituted TiNiSi-based compounds  $(\text{Ti}_{1-x}\text{V}_x)\text{NiSi}$  ( $x = 0, 0.05, 0.10, 0.15, \text{ and } 0.20$ ) using arc-melting and subsequent spark plasma sintering. An increase in the V content  $x$  improved the n-type TE properties: the absolute values of the Seebeck coefficient and electrical conductivity both increased, while the thermal conductivity slightly decreased. The highest dimensionless figure-of-merit,  $zT$ , was 0.032 at 600 K, obtained for the  $x = 0.20$  sample.

**Keywords:** TiNiSi-type compound; thermoelectric property; pseudogap; electronic structure

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## 1. Introduction

Thermoelectric (TE) conversion technologies have recently attracted much attention as potential clean energy harvesting techniques because heat energy is directly converted into electricity using

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