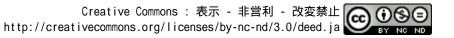
## 超高濃度ホウ素ドープSiGeによる巨大熱超電力の発 現とその応用

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## 2005 Fiscal Year Final Research Report Summary

## Generation of Giant Thermo-electric Power by Ultra-heavily Boron Doped SiGe and Its Application

**Research Project** 

Project/Area Number
15360161
Research Category
Grant-in-Aid for Scientific Research (B)
Allocation Type
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Section
一般
Research Field
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Research Institution
Kanazawa University
Principal Investigator
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Project Period (FY)
2003 – 2005
Keywords
Thermo-electric Effect / SiGe / Strain / Epitaxial Growth / Power Factor / Seebeck coefficient / Crystalline Defect / ZT

Research Abstract

Crystallinity :

Crystalline growth of SiGe films was slightly observed to take place at 400°C from XRD measurement. Below that the films were amorphous structure. The films were confirmed epitaxially grown from RHEED observation. Above 500°C, crystallinity was improved. Resistivity :

Until 400°C, film resistivity decreased with increasing growth temperature but above that, resistivity was increased again. This phenomena is explained that at low temperature carrier is not generated because of the amorphous structure. While crystalline growth proceeds, carrier comes to be generated. Under almost perfect crystalline structure, however, resistivity increases again because of intrinsic semiconductor resulting in no carrier genneration. The reason of low resistivity at 400°C is considered that appropriate crystalline defects generated carriers, which could conduct within the crystallized region. Seebeck coefficient :

SiGe films prepared showed large Seebeck coefficients of 1.5-2.0mV/K which is more than 3 times larger than that of bulk SiGe. No special coreration was observed on Seebeck coefficient with samples.

Thermo-electric performances :

Power factor was estimated from the Seebeck coeffcient and resistivity and showed as high as 7.2x10^<-2>Wm^<-1>K^<-2>. Moreover, the non-dimensional figure of merit Z reached ZT=1.3 at room temperature. This value shows useful for practical use.

## Research Products (17 results)

					All	200	6 200	5 2004	2003	Other
	All	Jou	rnal Articl	e Boo	ok	Paten	t(Indu	strial Pi	operty	Rights)
[Journal Article] Crystallinity and strain control growth of SiGe using ion sputtering technique									200	)6 ~
[Journal Article] A novel magnetron sputtering for flexible coatings as a function for production of high qualit	ty filn	ns							200	)6 ~
[Journal Article] Crystallinity and strain control growth of SiGe using ion sputtering technique									200	)6 ~
[Journal Article] Future Textile									200	)6 ~
[Journal Article] Unbalanced Magnetron Sputtering using Cylindrical Target for Low-temperature Optical Cost	ting								200	)5 ~
[Journal Article] A novel magnetron sputtering for flexible coatings as a function for production of high qualit	ty filn	ns							200	)5 ~
[Journal Article] 劣化エピタキシャル成長したSi-Ge系薄膜の熱電特性									200	)5 ~
[Journal Article] Unbalanced Magnetron Sputtering using Cylindrical Target for Low-temperature Optical Cost	ting								200	)5 ~
[Journal Article] Thermo-electric Properties of Deteriorate Epitaxial Grown Si-Ge Based Thin Films									200	)5 ~
[Journal Article] Sputter Growth SiGe Films-Epitaxy, Strain and Thermo-electric Properties									200	)4 ~
[Journal Article] Sputtering Epitaxy of SiGe Films Using Mixture Target									200	)4 ~
[Journal Article] Thermoelectric Properties of Si/Ge Multi-nanolaye Films Prepared by Ion-beam Sputtering T	Techn	nique							200	)4 ~
[Journal Article] Epitaxial Growth of SiGe Films Grown by Ion-Beam Sputtering and Generation of Large The	rmoe	electri	c Power						200	)4 ~
[Journal Article] Anomalous large thermoelectric power on heavily B-doped SiGe thin films with thermal annu	ealing	g							200	)3 ~
[Journal Article] A novel magnetron sputtering for flexible coatings as a function for production of high qualit	ty filn	ns								~
[Book] Future Texile									200	)6 ~
[Patent(Industrial Property Rights)] 傾斜材料とこれを用いた機能素子									200	)5 ~

URL: https://kaken.nii.ac.jp/report/KAKENHI-PROJECT-15360161/153601612005kenkyu\_seika\_hokoku\_

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