



Park Tae Yong

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Research experience

PuKyong National University

March 2015 — August 2017

Welding Metallurgy Laboratory

- Student researcher & Teaching assistant
- Metallographic observation
- Cooperation project with POSCO

Korea Institute of Ceramic Engineering
and Technology & PKNU

November 2017 — February 2020

Energy & Environmental Division

- KICET-PKNU Co-researcher
- Single crystal growth of wide band gap semiconductor material (SiC, AlN, Ga2O3)
- High temperature CVD process (graphene)

Education

Master of Engineering

March 2018 — February 2020

PuKyong National University

- Major: Department of Materials System Engineering
- GPA 4.02/4.5
- thesis "Effect of the graphite crucible emissivity on temperature gradient control of SiC single crystal growth furnace "
- Advisor: Young Soo Lim (PKNU), Seong Min Jeong (KICET)

Bachelor of Engineering

March 2012 — August 2017

PuKyong National University

- Major: Department of Materials System Engineering
- GPA 3.62/4.5

Skills and Techniques

Technical skills

- Growth process : Experienced in working with high temperature furnace for crystal growth
- Ability to use software : Origin, COMSOL, Solidworks, Mathematica

- materials characterizations : XRD, AFM, Raman, etc.
- Good command of Ms Office : Word, Excel, PowerPoint

Patents

- Single Crystal Solution Growth Apparatus and Method (10-2018-0166679)
- Single Crystal Solution Growth Apparatus (on progress)
- temperature gradient control by graphite emissivity control (on progress)

Publications

- Tae-Yong Park, Yun-Ji Shin, Si-Young Bae Seong-Min Jeong, "Effect of Radiation Heat Transfer on the Control of Temperature Gradient in the Induction Heating Furnace for Growing Single Crystals", J. Korean Inst. Electr. Electron. Mater. Eng. vol. 30 No 6, 522-527 (2019)
- Yun-Ji Shin, Tae-Yong Park, Si-Young Bae, and Seong-Min Jeong, "The effect of rotation on the macro-steps formation during 4H-SiC solution growth", Journal of the Korean Crystal Growth and Crystal Technology, Vol. 29, No.6, 1-4 (2019)

Conferences

- 2018.11.20 KIEEME Annual Autumn Conference "Effect of material properties of graphite crucible on the solution growth of SiC crystals"
- 2019.03.21 SiC Semiconductor Conference "Effect of the emissivity of graphite on solution growth of sic with induction heating furnace"
- 2019.05.15 The Korea Association of Crystal Growth Conference "Hot Zone Design of Induction Heating Furnace for Crystal Growth Considering Emissivity of Graphite"
- 2019.10.29 International Conference on Silicon Carbide and Related Materials "Hot-zone design of induction heating furnace for crystal growth with top seeded solution growth of SiC considering emissivity of graphite"
- 2019.11.05 International Conference on Advanced Electromaterials "HOT ZONE DESIGN OF INDUCTION HEATING FURNACE FOR SiC CRYSTAL GROWTH VIA TSSG METHOD CONSIDERING EMISSIVITY OF GRAPHITE"
- 2019.11.06 The Korea Association of Crystal Growth Conference "EFFECT OF THE HEAT RADIATION FROM THE GRAPHITE CRUCIBLE DURING TSSG PROCESS"

Award and Honor

- Outstanding Poster Paper Award (KIEEME Annual Autumn Conference)
- Award for Best Presentation (SiC Semiconductor Conference)
- First prize (KIEEME Photograph Competition for Material Engineers)

Reference

- Yong Soo Lim (Academic advisor) : PuKyong National University, yslim@pknu.ac.kr, +82-51-629-6384
- Seong Min Jeong (Advisor): Korea Institute of Ceramic Engineering and Tech., smjeong@kicet.re.kr, +82-55-792-2570
- Si Young Bae (Team advisor): Korea Institute of Ceramic Engineering and Tech., siyoubae@gmail.com, +82-10-5602-6630

Effect of Radiation Heat Transfer on the Control of Temperature Gradient in the Induction Heating Furnace for Growing Single Crystals

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Abstract: Compared to Si-based power electronic semiconductors, SiC-based power electronic semiconductors shows higher performances under high power and high frequency applications. To fabricate the SiC-based power electronic devices, high quality SiC substrate is highly required. To fabricate high quality SiC substrate, various single crystal growing methods are prepared include using physical vapor transport (PVT) method, high temperature chemical vapor deposition (HTCVD) method and top seeded solution growth (TSSG) method. All the suggested SiC growing methods generally uses induction heating furnaces, in which the temperature distribution is easily adjusted by changing the hotzone design. To fabricate high quality crystal, a precise temperature control in the induction heating furnace is highly required. In this study, we analyzed the heat transfer in the induction heating furnace for growing SiC crystals considering the heat transfer mechanisms. Since the growing temperature is quite high, we evaluated the effect of radiation heat transfer on the temperature distribution in the induction heating furnace. Based on the simulation result, The heat transfer strategy was suggested to obtain optimal temperature distribution in PVT and TSSG by controlling radiation heat transfer.

Keywords: SiC, Single crystal growth, Induction heating furnace, Radiation heat transfer, Simulation

The effect of rotation on the macro-steps formation during 4H-SiC solution growth

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Abstract: New insights about macro-step formation has been investigated. The phenomena of surface instability caused by the interaction between step flow and fluid flow was describe in mechanical way. The rotation of the seed crystal in a clockwise direction was applied with a speed varied from 30 to 200 rpm during the TSSG process on the Si- and C-faces 4H-SiC. The macro-steps were formed along the two specific directions at different locations on the crystal for each, i.e., $[10-10]$ or $[01-10]$ directions or both. From the results, it is suggested that the macro-steps were generated from the microsteps by interaction between step flow and fluid flow during the rotation of seed crystal. Furthermore, The fluid flow could be effective to control the micro- and/or macro-step behavior during solution growth.

Key words: SiC, Solution growth, Surface instability, Macro-steps, Fluid dynamics