

HWANGBO, Dogyun

Curriculum Vitae

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PERSONAL DETAILS

Current affiliation University of Tsukuba, Japan
Address Plasma Research Center, 1-1-1 Tennodai, Tsukuba, Japan
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EDUCATION

Ph.D. in Engineering Mar 2017-Sep 2019
Nagoya University
Title: Arcing on fiberform nanostructured metal surfaces formed by helium plasma exposure

Joint Course Mar 2013-Sep 2019
Nagoya University
The Leading Graduate School: Frontier Space

Master of Engineering Apr 2013-Mar 2017
Nagoya University
Title: Observation of arc spots and erosion on nanostructured metals
(*Two years delayed due to military service)

Bachelor of Engineering Apr 2009-Mar 2013
Nagoya University
Title: Spectroscopic measurement of arc spots induced on nanostructured tungsten

WORK EXPERIENCE

Assistant Professor Dec 2019-present
University of Tsukuba, Full-time
Plasma-surface interactions, divertor plasmas, atmospheric plasma development and applications

Post Doc. Researcher Oct 2019-Nov 2019
Nagoya University, Full-time
Divertor plasmas, arcing on nanostructured metals, impurity-assisted nanostructuring on metals

SCHOLARSHIP/FELLOWSHIP

Research Fellowship for Young Scientists PD Oct 2019-Nov 2019
Japan Society for the Promotion of Sciences (JSPS)
Divertor plasmas, arcing on nanostructured metals, impurity-assisted nanostructuring on metals

Research Fellowship for Young Scientists DC1 Apr 2017-Sep 2019
Japan Society for the Promotion of Sciences (JSPS)
Divertor plasmas, arcing on nanostructured metals, impurity-assisted nanostructuring on metals

Research Assistant and Teaching Assistant Jun 2013-Mar 2019
Leading Graduate School (Frontier Space), Nagoya University

Government Scholarship Mar 2008-Mar 2013
Korea-Japan Joint Government Scholarship Program for the Students in Science and Engineering Departments

OVERSEAS RESEARCH EXPERIENCE

W7-X in-vessel investigation Aug 2023 (1 week)
Max-Planck Institute for Plasma Physics Greifswald, Germany

PISCES-A experiment Aug 2023 (2 weeks)

Center for Energy Research, UC San Diego, USA

Magnum-PSI, Upgraded Pilot-PSI experiments Mar 2023 (2 weeks)

DIFFER, the Dutch Institute for Fundamental Energy Research, The Netherlands

Upgraded Pilot-PSI experiment Sep 2022 (2 weeks)

DIFFER, the Dutch Institute for Fundamental Energy Research, The Netherlands

PISCES-A experiment Jul 2022 (2 weeks)

Center for Energy Research, UC San Diego, USA

Upgraded Pilot-PSI experiment May 2022 (1 week)

DIFFER, the Dutch Institute for Fundamental Energy Research, The Netherlands

PISCES-A experiment Feb 2019 (3 weeks)

Center for Energy Research, UC San Diego, USA

W7-X in-vessel investigation Jan 2019 (2 weeks)

Max-Planck Institute for Plasma Physics Greifswald, Germany

PISCES-A experiment Sep 2017-Dec 2017

Center for Energy Research, UC San Diego, USA

GRANTS

General collaboration project, NIFS23KIPP030, PI Apr 2023-Present

National Institute for Fusion Sciences, Japan

General collaboration project (workshop), NIFS23KIGP007, PI Apr 2023-Present

National Institute for Fusion Sciences, Japan

Bilateral collaboration project, NIFS23KUGM180, PI Apr 2023-Present

National Institute for Fusion Sciences, Japan

Grant-in-Aid for Early-Career Scientists, 23K13083, PI Apr 2023-Present

Japan Society for the Promotion of Sciences (JSPS)

DEMO Reactor R&D, NIFS22HDAF009, Co-investigator Jul 2022-Present

National Institute for Fusion Sciences, Japan

Fund for the Promotion of Joint International Research (Fostering Joint International Research (B)), 21KK0048, Co-investigator Apr 2021-Present

Japan Society for the Promotion of Sciences (JSPS)

Grant-in-Aid for Scientific Research, 21H01059, Co-investigator Apr 2021-Present

Japan Society for the Promotion of Sciences (JSPS)

Tsukuba Basic Research Support Program Type S, PI Sep 2020-Mar 2023

University of Tsukuba, Japan

Collaborative research, PI Oct 2020-Mar 2023

Hitach, Ltd. Research & Development Group

Bilateral collaboration project, NIFS20KUGM152, PI Apr 2020-Mar 2023

National Institute for Fusion Sciences, Japan

General collaboration project, NIFS20KLPP067, PI Apr 2020-Mar 2023

National Institute for Fusion Sciences, Japan

Grant-in-Aid for Research Activity Start-up, 20K22322, PI Sep 2020-Mar 2022

Japan Society for the Promotion of Sciences (JSPS)

Grant-in-Aid for JSPS Fellows, 17J05670, PI Apr 2017-Nov 2019

Japan Society for the Promotion of Sciences (JSPS)

New generation NET- ULTARI, Co-investigator May 2019-Nov 2019

KOFST, Korea

New generation NET- ULTARI, Co-investigator Jun 2018-Dec 2018

KOFST, Korea

Grant for Original Research: Instrument R&D, PI May 2019-Nov 2019

SKILLS

Languages	Korean (mother tongue) Japanese (fluent) English (fluent)
Software	MATLAB, L ^A T _E X, IGOR
Programming languages	C++, PYTHON

AWARDS

Young Scientist Presentation Award <i>The 33rd Annual Meeting for the Japan Society of Plasma Science and Nuclear Fusion Research</i>	Dec 2016
Outstanding Graduate Student Award <i>Nagoya University</i>	Jun 2018
Trusted Reviewer Status <i>Institute of Physics (IOP)</i>	Dec 2021
Best Oral Presentation Award <i>14th International Symposium on Advanced Plasma Science and its Applications for Nitrides and Nano-materials (ISPlasma2022)</i>	Mar 2022
Outstanding Reviewer Awards 2021 <i>Physica Scripta, Institute of Physics (IOP)</i>	Apr 2022

JOURNALS: FIRST/CORRESPONDING AUTHORED

- [1] Dogyun Hwangbo, Shin Kajita, Masashi Osaka, and Noriyasu Ohno. Spectroscopic study and motion analysis of arc spot initiated on nanostructured tungsten. *Japanese Journal of Applied Physics*, 52(11S):11NC02, 2013.
- [2] Dogyun Hwangbo, Shin Kajita, Sergey A Barengolts, Mikhail M Tsventoukh, and Noriyasu Ohno. Transition in velocity and grouping of arc spot on different nanostructured tungsten electrodes. *Results in Physics*, 4:33–39, 2014.
- [3] Dogyun Hwangbo, Shin Kajita, Noriyasu Ohno, and Dmitry Sinelnikov. Field emission from metal surfaces irradiated with helium plasmas. *IEEE Transactions on Plasma Science*, 45(8):2080–2086, 2017.
- [4] Dogyun Hwangbo, Shota Kawaguchi, Shin Kajita, and Noriyasu Ohno. Erosion of nanostructured tungsten by laser ablation, sputtering and arcing. *Nuclear Materials and Energy*, 12:386–391, 2017.
- [5] Dogyun Hwangbo, Shin Kajita, Sergey A Barengolts, Mikhail M Tsventoukh, Shota Kawaguchi, Vadim G Mesyats, and Noriyasu Ohno. Ignition and erosion of materials by arcing in fusion-relevant conditions. *Contributions to Plasma Physics*, 58(6-8):608–615, 2018.
- [6] Dogyun Hwangbo, Shin Kajita, Noriyasu Ohno, Patrick McCarthy, James W Bradley, and Hirohiko Tanaka. Growth of nano-tendrils on tungsten with impurity-rich He plasmas. *Nuclear Fusion*, 58(9):096022, 2018.
- [7] Dogyun Hwangbo, Shin Kajita, Hirohiko Tanaka, and Noriyasu Ohno. Growth process of nano-tendrils with sputtered tungsten. *Nuclear Materials and Energy*, 18:250–257, 2019.
- [8] Dogyun Hwangbo, Daisuke Nishijima, Shin Kajita, Russell P Doerner, Sergey A Barengolts, Mikhail M Tsventoukh, Hirohiko Tanaka, and Noriyasu Ohno. Ignition and sustainment of arcing on nanostructured tungsten under plasma exposure. *IEEE Transactions on Plasma Science*, 47(8):3617–3625, 2019.
- [9] Dogyun Hwangbo, Shin Kajita, Chandra Prakash Dhard, Masayuki Tokitani, Marco Krause, Dirk Naujoks, Suguru Masuzaki, Sören Klose, Noriyasu Ohno, et al. Inspection of arc trails formed in stellarator/heliotron devices W7-X and LHD. *Plasma and Fusion Research*, 15:2402012–2402012, 2020.

- [10] Dogyun Hwangbo, Daisuke Nishijima, Shin Kajita, Russell P Doerner, and Noriyasu Ohno. Unipolar arc plasmas on nanostructured tungsten surfaces under perpendicular magnetic field. *Plasma Sources Science and Technology*, 29(12):125015, 2020.
- [11] Dogyun Hwangbo. Status and prospects of arcing in the magnetic confinement fusion studies. *Purazuma, Kaku Yugo Gakkai-Shi*, 97(4):221–228, 2021.
- [12] Dogyun Hwangbo, Daisuke Nishijima, Shin Kajita, and Noriyasu Ohno. Motion analysis of arc spots on tungsten fuzz by means of self-avoiding random walk model. *Japanese Journal of Applied Physics*, 62(SA):SA1007, 2022.
- [13] Takahisa Sakai, Dogyun Hwangbo, Naoki Oriyasa, Mikoto Kusumoto, Katsutomo Takatsu, Haru Yoshida, Aoi Fujimori, Ryusei Nitta, and Mizuki Sakamoto. Effect of deuterium fluence on deuterium retention in tungsten with fibrous nanostructured layer in a compact plasma device APSEDAS. *Plasma and Fusion Research*, 17:2405062–2405062, 2022.

JOURNALS: CO-AUTHORED

- [1] Shin Kajita, Dogyun Hwangbo, Noriyasu Ohno, Mikhail M Tsventoukh, and Sergey A Barengolts. Arc spot grouping: An entanglement of arc spot cells. *Journal of Applied Physics*, 116(23), 2014.
- [2] Shin Kajita, Tomoya Ishida, Noriyasu Ohno, Dogyun Hwangbo, and Tomoko Yoshida. Fuzzy nanostructure growth on Ta/Fe by he plasma irradiation. *Scientific Reports*, 6(1):30380, 2016.
- [3] D Sinelnikov, D Bulgadaryan, D Hwangbo, S Kajita, D Kolodko, V Kurnaev, and N Ohno. Arc tracks on nanostructured surfaces after microbreakdowns. *Journal of Physics: Conference Series*, 748(1):012012, 2016.
- [4] Sergey A Barengolts, Vadim G Mesyats, Mikhail M Tsventoukh, Shin Kajita, Dogyun Hwangbo, and Noriyasu Ohno. Effect of the nanostructured layer thickness on the dynamics of cathode spots on tungsten. *IEEE Transactions on Plasma Science*, 46(11):4044–4050, 2018.
- [5] D Bulgadaryan, D Sinelnikov, V Kurnaev, S Kajita, D Hwangbo, and N Ohno. Proton scattering from tungsten fuzz. *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms*, 434:9–12, 2018.
- [6] Shin Kajita, Shota Kawaguchi, Dogyun Hwangbo, Hirohiko Tanaka, and Noriyasu Ohno. Pulsation effects of incident ion energy on w fuzz growth. *Plasma and Fusion Research*, 13:1205001–1205001, 2018.
- [7] Shin Kajita, Dogyun Hwangbo, and Noriyasu Ohno. Ignition and behavior of arc spots on helium irradiated tungsten under fusion relevant condition. *IEEE Transactions on Plasma Science*, 47(8):3609–3616, 2019.
- [8] D Nishijima, A Kreter, MJ Baldwin, D Borodin, A Eksaeva, D Hwangbo, S Kajita, M Miyamoto, N Ohno, M Patino, et al. Influence of heavier impurity deposition on surface morphology development and sputtering behavior explored in multiple linear plasma devices. *Nuclear materials and energy*, 18:67–71, 2019.
- [9] Dmitry Sinelnikov, Daniel Bulgadaryan, Dogyun Hwangbo, Shin Kajita, Valery Kurnaev, and Noriyasu Ohno. Field emission from nanostructured tendrils bundles. *IEEE Transactions on Plasma Science*, 47(11):5186–5190, 2019.
- [10] SA Barengolts, D Hwangbo, S Kajita, N Ohno, VP Frolova, AG Nikolaev, EM Oks, DL Shmelev, MM Tsventoukh, and G Yu Yushkov. Dynamics of the changes in the parameters of the arc plasma during the destruction of a helium-induced tungsten fuzz by arc pulses. *Nuclear Fusion*, 60(4):044001, 2020.
- [11] CP Dhard, S Äkäslompolo, M Balden, J Baldzuhn, C Biedermann, T Bräuer, S Brezinsek, M Endler, Y Hayashi, D Hwangbo, et al. Inspection of W7-X plasma-facing components after the operation phase OP1.2b: observations and first assessments. *Physica Scripta*, 2020(T171):014033, 2020.
- [12] Aneeqa Khan, Gregory De Temmerman, Shin Kajita, Henri Greuner, M Balden, K Hunger, N Ohno, D Hwangbo, Y Tomita, M Tokitani, et al. Helium irradiation effects on the surface modification and recrystallization of tungsten. *Physica Scripta*, 2020(T171):014050, 2020.
- [13] Patrick McCarthy, Dogyun Hwangbo, Matthew Bilton, Shin Kajita, and James W Bradley. Enhanced fuzzy tungsten growth in the presence of tungsten deposition. *Nuclear Fusion*, 60(2):026012, 2020.

- [14] Rongshi Zhang, Dogyun Hwangbo, Shin Kajita, Hirohiko Tanaka, and Noriyasu Ohno. Size distribution of nano-tendril bundles with various additional impurity gases. *Nuclear Materials and Energy*, 25:100843, 2020.
- [15] CP Dhard, S Brezinsek, M Mayer, D Naujoks, S Masuzaki, D Zhao, R Yi, J Oelmann, K Schmid, J Romazanov, et al. Plasma-wall interaction studies in W7-X: main results from the recent divertor operations. *Physica Scripta*, 96(12):124059, 2021.
- [16] Hiroki Gamo, Naomichi Ezumi, Tsukasa Sugiyama, Kunpei Nojiri, Ayane Kondo, Mafumi Hirata, Junko Kohagura, Masayuki Yoshikawa, Yousuke Nakashima, Dogyun Hwangbo, et al. Influence of nitrogen ratio on plasma detachment during combined seeding with hydrogen on divertor simulation experiment of GAMMA 10/PDX. *Plasma and Fusion Research*, 16:2402041–2402041, 2021.
- [17] Yuki Hayashi, Suguru Masuzaki, Gen Motojima, Dogyun Hwangbo, Yutaka Fujiwara, Mingzhong Zhao, LHD Experiment Group, et al. Observation of arc trails with significant damage due to glow discharge wall conditioning in the large helical device. *Plasma and Fusion Research*, 16:1202061–1202061, 2021.
- [18] VV Kulagin, DN Sinelnikov, DG Bulgadaryan, NE Efimov, VA Kurnaev, D Hwangbo, N Ohno, and S Kajita. Nano-tendril bundles behavior under plasma-relevant electric fields. *Vacuum*, 183:109799, 2021.
- [19] Patrick McCarthy, Dogyun Hwangbo, Shin Kajita, and James W Bradley. The effects of impurity gas seeding on the growth of fuzzy tungsten. *Journal of Nuclear Materials*, 556:153125, 2021.
- [20] Rongshi Zhang, Shin Kajita, Dogyun Hwangbo, Hirohiko Tanaka, and Noriyasu Ohno. Enhancement of arc ignition on tungsten in helium plasmas with impurity gases. *Plasma and Fusion Research*, 16:2405069–2405069, 2021.
- [21] Rongshi Zhang, Shin Kajita, Dogyun Hwangbo, Dmitry Sinelnikov, Hirohiko Tanaka, and Noriyasu Ohno. Changes in morphology and field emission property of nano-tendril bundles after high temperature annealing. *Nuclear Materials and Energy*, 31:101178, 2022.
- [22] SA Barendolts, D Hwangbo, and S Kajita. Arc erosion characteristics of W-fuzz samples with different thicknesses of the nanostructured layer. *Nuclear Materials and Energy*, 37:101541, 2023.
- [23] Rongshi Zhang, Shin Kajita, Dogyun Hwangbo, Hirohiko Tanaka, Shuangyuan Feng, and Noriyasu Ohno. Field emission properties of nano-tendril bundles formed via helium plasma exposure with various additional impurity gases. *Materials Research Express*, 10(5):054002, 2023.

CONFERENCE PROCEEDINGS

- [1] Sergey A Barendolts, Mikhail M Tsventoukh, Shin Kajita, Dogyun Hwangbo, and Noriyasu Ohno. Effect of nanostructured layer thickness on tungsten surface on cathode spots dynamics. In *2016 27th International Symposium on Discharges and Electrical Insulation in Vacuum (ISDEIV)*, volume 1, pages 1–4. IEEE, 2016.
- [2] D Hwangbo, S Kajita, N Ohno, and D Sinelnikov. Field electron emission from metal surfaces irradiated with helium plasmas. In *2016 27th International Symposium on Discharges and Electrical Insulation in Vacuum (ISDEIV)*, volume 1, pages 1–4. IEEE, 2016.
- [3] D Sinelnikov, D Bulgadaryan, D Hwangbo, S Kajita, D Kolodko, V Kurnaev, and N Ohno. Vacuum breakdown from nanostructured fuzzy surfaces. In *2016 27th International Symposium on Discharges and Electrical Insulation in Vacuum (ISDEIV)*, volume 1, pages 1–4. IEEE, 2016.
- [4] Dogyun Hwangbo, Daisuke Nishijima, Sergey Barendolts, Shin Kajita, Mikhail Tsventoukh, Russ Doerner, Hirohiko Tanaka, and Noriyasu Ohno. Ignition and sustainment of arcing on nanostructured tungsten under plasma exposure. In *2018 28th International Symposium on Discharges and Electrical Insulation in Vacuum (ISDEIV)*, volume 1, pages 757–760. IEEE, 2018.
- [5] Dmitry Sinelnikov, Shin Kajita, Daniel Bulgadaryan, Valery Kurnaev, Dogyun Hwangbo, and Noriyasu Ohno. Emission from tungsten nanostructured tendril bundles under local thermal load. In *2018 28th International Symposium on Discharges and Electrical Insulation in Vacuum (ISDEIV)*, volume 1, pages 31–34. IEEE, 2018.
- [6] A Khan, G De De Temmerman, S Kajita, H Greuner, N Ohno, D Hwangbo, Y Tomita, M Tokitani, D Nagata, and M Yajima. Effect of He plasma irradiation on recrystallization properties of tungsten. In *17th International Conference on Plasma-Facing Materials and Components for Fusion Applications (PFMC-17)*, 2019.

- [7] Dmitry Sinelnikov, Daniel Bulgadaryan, Nikita Efimov, Dogyun Hwangbo, Vladimir Kulagin, Valery Kurnaev, Shin Kajita, and Noriyasu Ohno. Overheating of nanostructured tendril bundles due to thermo-field emission. In *2020 29th International Symposium on Discharges and Electrical Insulation in Vacuum (ISDEIV)*, pages 77–80. IEEE, 2021.
- [8] Dogyun Hwangbo, Shuangyuan Feng, Rongshi Zhang, Shin Kajita, MD Maria Cunha, Remco Timmer, Jordy Vernimmen, John Scholten, Hirohiko Tanaka, Yuki Hayashi, et al. Arc ignition and hot spot formation on tungsten with nano-tendril bundles under hydrogen plasma exposure. In *2023 30th International Symposium on Discharges and Electrical Insulation in Vacuum (ISDEIV)*, pages 533–536. IEEE, 2023.
- [9] Rongshi Zhang, Shin Kajita, Hirohiko Tanaka, Dogyun Hwangbo, and Noriyasu Ohno. Field emission current from protrusion structures formed by helium plasma with various impurity gases. In *2023 30th International Symposium on Discharges and Electrical Insulation in Vacuum (ISDEIV)*, pages 529–532. IEEE, 2023.

INVITED/ORAL TALKS

- [1] D Hwangbo, D Nishijima, S Kajita, RP Doerner, N Ohno, and H Tanaka. Arc behavior on tungsten nanostructure under helium plasma exposure. In *34th International Conference on Phenomena in Ionized Gases (ICPIG2019)*, July 14-19 2019. Sapporo, Japan.
- [2] D Hwangbo, D Nishijima, S Kajita, and N Ohno. Motion analysis of arc spots on tungsten fuzz by means of self-avoiding random walk model. In *14th International Symposium on Advanced Plasma Science and its Applications for Nitrides and Nanomaterials (ISPlamsa2022)*, March 6-10 2022. Nagoya, Japan.
- [3] D Hwangbo and D Nishijima. Spectroscopic measurement of deuterium recycling at molybdenum surfaces. In *Global Plasma Forum in Aomori*, October 15-18 2023. Aomori, Japan [Invited].