Curriculum Vitae (Bhagirath Ghimire)

Affiliation: Principal Research Scientist I, Centre for Space Plasma and Aeronomic Research, The University of Alabama in Huntsville, 320 Sparkman Drive, Alabama 35805.

Cell phone: +12567500216

Email: bhagirath.ghimire@uah.edu; ghimirebhagi@hotmail.com

Research interests

1. Development of cold atmospheric pressure plasma sources (Plasma jets and Dielectric Barrier Discharge (DBDs))
2. Characterization of plasma sources – electrical and spectroscopic (emission/absorption) techniques [OES, LIF, CEAS, UV-Vis]
3. Plasma-liquid interactions and Plasma Chemistry
4. Development of Medical Device using Cold Plasma Technology and its Standardization
5. Application of cold plasmas in medicine, agriculture, poultry, material processing, space, etc.
6. Environmental application of plasmas

Education and Qualifications

2019	PhD in Low Temperature Plasma, Kwangwoon University, Seoul, Korea (Supervisor: Professor Eun Ha Choi) Thesis title: "Characteristics of cold atmospheric pressure plasma jets interacting with liquids and transport mechanism of reactive species"
2014	Masters in Physics, Tribhuvan University, Kathmandu, Nepal (Supervisor: Professor Deepak Subedi & Raju Khanal) Thesis title: "Improvement of wettability and absorbancy of textile using atmospheric pressure dielectric barrier discharge"
2008	Bachelor in Physics, Tribhuvan University, Kathmandu, Nepal

Work and Research Experience

Dec 2022 - Present	Principal Research Scientist I, Centre for Space Plasma and Aeronomic Research, The University of Alabama in Huntsville, Alabama (USA)
Sep 2021 – Dec 2022	Postdoctoral Research Assistant III, Centre for Space Plasma and Aeronomic Research, The University of Alabama in Huntsville, Alabama (USA)
Apr 2019 – Sep 2021	Senior Research Associate, Department of Chemistry, Lancaster University, Lancaster (United Kingdom)
Mar 2015 –Mar 2019	Plasma Bioscience Research Centre (PBRC), Seoul (South Korea)
Feb 2012 - Mar 2014	Researcher in low temperature plasma, Plasma Physics Laboratory, Kathmandu University (Nepal)

List of Publications

Year	Article Details
2023	1.Baz, A., Bakri, A., Butcher, M., Short, B., **Ghimire, B.**, Gaur, N., Jenkins, T., Short, R. Riggio, M., Williams, C., Ramage, G., & Brown, J. (2023). Staphylococcus aureus strains exhibit heterogenous tolerance to direct cold atmospheric plasma therapy. *Biofilm* . accepted for publication 15 Apr 2023.
	2. Gaur N., Patenall, B., **Ghimire, B.**, Thet, N., Gartiner, J., Doare, K., Ramage, G., Short, B., Heylen, R., Williams, C., Short, R., & Jenkins, T. (2023). Cold Atmospheric Plasma-Activated Composite Hydrogel for an Enhanced and On-Demand Delivery of Antimicrobials. *ACS Applied Materials & Interfaces*, accepted for publication 11 April 2023.
	3. **Ghimire, B.**, Briggs L., Mayo, J., Sysoeva, T., & Xu, K.G. (2023). Contrasting the characteristics of atmospheric pressure plasma jets operated by single and double dielectric material. *Journal of Physics D: Applied Physics*, *56*(2), 085205.
	4. **Ghimire, B.**, Kolobov, V., & Xu, K.G. (2023). Influence of liquid conductance on the temporal evolution of self-organization patterns on plasma-liquid interface. *Physica Scripta*, accepted for publication 27 July 2023.
2022	1. **Ghimire, B**., Patenall, B. L., Szili, E. J., Gaur, N., Lamichhane, P., Thet, N. T., Jenkins, A.T. & Short, R. D., (**2022**). The influence of a second ground electrode on hydrogen peroxide production from an atmospheric pressure argon plasma jet and correlation to antibacterial efficacy and mammalian cell cytotoxicity. *Journal of Physics D: Applied Physics*, *55*(12), 125207.
	2. **Ghimire, B.**, Szili, E. J., and Short, R.D. A conical assembly of six plasma jets for biomedical applications, *Applied Physics Letters* 121, 084102.
	3. Szili, E., Patenall, B., Fellows, A., Mistry, D., Jenkina, T., Short, R. & **Ghimire, B.** (2022). On Plasma Activated Acetyl Donors: Comparing the Antibacterial Efficacy of Tetraacetylethylenediamine and Pentaacetate Glucose. *Plasma* 5(4), 423-425.
2021	1. **Ghimire, B.,** Szili, E. J., Patenall, B. L., Fellows, A., Mistry, D., Jenkins, A. T. A., & Short, R. D. (2021). Cold Plasma Generation of Peracetic Acid for Antimicrobial Applications. *Plasma Medicine*, 11(4):73–84.
	2. **Ghimire, B**., Szili, E. J., Patenall, B. L., Lamichhane, P., Gaur, N., Robson, Jenkins, A.T. & Short, R. D. (**2021**). Enhancement of hydrogen peroxide production from an atmospheric pressure argon plasma jet and implications to the antibacterial activity of plasma activated water. *Plasma Sources Science and Technology*, *30*(3), 035009.
	3. Szili, E. J., **Ghimire, B. <Equal first authors>,** Patenall, B. L., Rohaim, M., Mistry, D., Fellows, A., Jenkins, T.A. & Short, R. D. (**2021**). On-demand cold plasma activation of acetyl donors for bacteria and virus decontamination. *Applied Physics Letters*, *119*(5), 054104.
	4. Lim, J. S., Hong, Y.J., **Ghimire, B.,** Choi, J., Mumtaz, S., Choi, E. H., (2021). Measurement of electron density in transient spark discharge by simple interferometry. *Results in Physics*, 20 (2021), 103693.
2020	1. Adhikari, B., Adhikari, M., **Ghimire, B.**, Adhikari, B. C., Park, G., Choi, E. H., (2020). Cold plasma seed priming modulates growth, redox homeostasis and stress response by

inducing reactive species in tomato (Solanum lycopersicum). *Free Radical Biology and Medicine*, 156, 57-69.

2. Lamichhane, P., Adhikari, B. C., Nguyen, L. N., Paneru, R., **Ghimire, B.,** Mumtaz, S., ... & Choi, E. H. (2020). Sustainable nitrogen fixation from synergistic effect of photo-electrochemical water splitting and atmospheric pressure N2 plasma. *Plasma Sources Science and Technology*, *29*(4), 045026.

3. Yadav, D. K., Adhikari, M., Kumar, S., **Ghimire, B.,** Han, I., Kim, M. H., & Choi, E. H. (**2020**). Cold atmospheric plasma generated reactive species aided inhibitory effects on human melanoma cells: an in vitro and in silico study. *Scientific reports*, *10*(1), 1-15.

4. Adhikari, M., Adhikari, B., **Ghimire, B.,** Baboota, S., Choi, E. H., (2020). Cold Atmospheric Plasma and Silymarin Nanoemulsion Activate Autophagy in Human Melanoma Cells. *International journal of molecular sciences*, 21(6), 1939.

2019 1. **Ghimire, B**., Szili, E. J., Lamichhane, P., Short, R. D., Lim, J. S., Attri, P., ... & Choi, E. H., (2019). The role of UV photolysis and molecular transport in the generation of reactive species in a tissue model with a cold atmospheric pressure plasma jet. *Applied Physics Letters*, *114*(9), 093701.

2. Adhikari, M., Kaushik, N., **Ghimire, B.,** et al. (2019). Cold atmospheric plasma and silymarin nanoemulsion synergistically inhibits human melanoma tumorigenesis via targeting HGF/c-MET downstream pathway. *Cell Communication and Signaling*, 17(1), 52.

3. Adhikari, B., Adhikari, M., **Ghimire, B**., Park, G., & Choi, E. H., (2019). Cold atmospheric plasma-activated water irrigation induces defense hormone and gene expression in tomato seedlings. *Scientific reports*, *9*(1), 1-15.

4. Kaushik, N. K., Kaushik, N., Adhikari, M., **Ghimire, B**., Linh, N. N., Mishra, Y. K., ... & Choi, E. H., (2019). Preventing the solid cancer progression via release of anticancer-cytokines in co-culture with cold plasma-stimulated macrophages*. Cancers*, *11*(6), 842.

5. Lamichhane, P., **Ghimire, B**., Mumtaz, S., Paneru, R., Ki, S. H., & Choi, E. H., (2019). Control of hydrogen peroxide production in plasma activated water by utilizing nitrification. *Journal of Physics D: Applied Physics*, *52*(26), 265206.

6. Kim, J., **Ghimire, B**., Lim, S., Choi, E. H., Park, H. K., & Kaushik, N. K., (2019). Coagulation, deformability, and aggregation of RBCs and platelets following exposure to dielectric barrier discharge plasma with the use of different feeding gases. *Journal of Physics D: Applied Physics*, *52*(15), 155202.

7. Kaushik, N. K., Kaushik, N., Linh, N. N., **Ghimire, B.**, Pengkit, A., Sornsakdanuphap, J., Lee, S. J., Choi, E. H., (2019). Plasma and Nanomaterials: Fabrication and Biomedical Applications. Nanomaterials, 9(1):98.

8. Kaushik, N. K., **Ghimire, B.** <equal co-first authors>**,** Li, Y., Adhikari, M., Veerana, M., Kaushik, N., ... & Choi, E. H., (2019). Biological and medical applications of plasma-activated media, water and solutions. *Biological chemistry*, *400*(1), 39-62.

2018 1. **Ghimire, B**., Lamichhane, P., Lim, J. S., Min, B., Paneru, R., Weltmann, K. D., & Choi, E. H., (2018). An atmospheric pressure plasma jet operated by injecting natural air. *Applied Physics Letters*, *113*(19), 194101.

2. **Ghimire, B**., Lee, G. J., Mumtaz, S., & Choi, E. H., (2018). Scavenging effects of ascorbic acid and mannitol on hydroxyl radicals generated inside water by an atmospheric pressure plasma jet. *AIP Advances*, *8*(7), 075021.

3. Mumtaz, S., Lim, J. S., **Ghimire, B.,** Lee, S. W., Choi, J. J., & Choi, E. H., (2018). Enhancing the power of high power microwaves by using zone plate and investigations for the position of virtual cathode inside the drift tube. *Physics of Plasmas*, *25*(10), 103113.

2017

1. **Ghimire, B.,** Sornsakdanuphap, J., Hong, Y. J., Uhm, H. S., Weltmann, K. D., & Choi, E. H., (2017). The effect of the gap distance between an atmospheric-pressure plasma jet nozzle and liquid surface on OH and N2 species concentrations. *Physics of Plasmas*, *24*(7), 073502.

2. **Ghimire, B**., Subedi, D. P., & Khanal, R., (2017). Improvement of wettability and absorbancy of textile using atmospheric pressure dielectric barrier discharge. *AIP Advances*, *7*(8), 085213.

3. Lee, G. J., Choi, M. A., Kim, D., Kim, J. Y., **Ghimire, B.,** Choi, E. H., & Kim, S. H. (2017). Influence of plasma-generated reactive species on the plasmid DNA structure and plasmid-mediated transformation of Escherichia coli cells. *Journal of Applied Physics*, *122*(10), 103303.

4. Sornsakdanuphap, J., Suanpoot, P., Hong, Y. J., **Ghimire, B.,** Cho, G., Uhm, H. S., ... & Choi, E. H., (2017). Electron temperature and density of non-thermal atmospheric pressure argon plasma jet by convective wave packet model. *Journal of the Korean Physical Society*, *70*(11), 979-989.

Patent

A plasma device for plasma activated hydrogel therapy, PCT application number: PCT/GB2021/051154, Filing date: 13 May 2020 (International publication number: WO 2021/229233 A1, US20230181783A1).

Conference Presentations

- **Poster presentation**, PW-P016, "*Hydroxyl radical species generated by non-thermal direct plasma jet and their qualitative evaluation*" In: 50th Winter Annual Conference of the Korean Vacuum Society (February 17-19, 2016, Welli-Hilli Park, Gangwon, Korea).

- **Poster presentation**, PST-P1-174, "*Characteristics of direct plasma jet impinging above water surface and temporal behavior of OH and NO radicals, poster presentation*" In: International Symposium on Plasma Bio-Science 2016 (August 21-26, 2016, Busan, Korea).

- **Poster presentation**, PW-P017, "*Effect of plasma jet irradiation distance on the formation of reactive oxygen and nitrogen species in atmospheric pressure plasma jet exposed to liquid surface*" In: 52nd Winter Annual Conference of the Korean Vacuum Society (February 17-19, 2016, Welli-Hilli Park, Gangwon, Korea).

- **Poster presentation**, ThP-47, "*Generation and scavenging of reactive oxygen species in water by atmospheric pressure plasma jet*" In: International Symposium on Plasma Bio-Science 2017 (June 27-29, 2017, Jeju, Korea).
- **Poster presentation**, ThP-48, "*Effect of plasma initiated ultra-violet photolysis, transport and their combinations in the generation of reactive oxygen and nitrogen species inside liquids*

exposed to atmospheric pressure plasma jet" In: International Symposium on Plasma Bio-Science 2017 (June 27-29, Jeju, Korea).

- **Poster presentation**, PW-P005, "*Mechanim of UV photolysis and transport on the production of reactive oxygen and nitrogen species inside liquids exposed to atmospheric pressure plasma jet*" In: 53rd Summer Annual Conference of the Korean Vacuum Society (August 16-18, 2017, Vivaldi Park, Gangwon, Korea).

- **Poster presentation**, PW-P012, "*The mechanism of plasma jet delivery of reactive species inside tissues*" In: 52nd Winter Annual Conference of the Korean Vacuum Society (February 7-9, 2018, Welli-Hilli Park, Gangwon, Korea.

- **Poster presentation**, PO-66, "*The mechanism of plasma jet delivery of reactive species in tissues*" In: 7th International Conference on Plasma Medicine (ICPM7) June 17-22, 2018, Philadelphia, USA.

- **Poster presentation**, WP-018, "*The mode of plasma jet delivery of reactive species in biological tissues*" In: International Symposium on Plasma Bio-Science 2018 (July 24-28, 2018, Incheon, Korea).

- **Poster Presentation**, "*Characteristics of DC discharges with a liquid cathode and a metal anode*" In:, 75th Gaseous Electronics Conference, 03 Oct – 06 Oct, 2022, Sendai, Japan.

- **Poster Presentation,** "*Propagation of atmospheric pressure plasma inside a helical tube*" In: 65th Annual Meeting of the APS Division of Plasm Physics, 30 Oct – 03 Nov 2023, Colorado United States.

- **Oral Presentation**, "*Enhancement of hydrogen peroxide production from an atmospheric pressure argon plasma jet*", In: 8th International Conference on Plasma Medicine (ICPM8) August 3-6, 2021, Seoul, South Korea.

- **Oral Presentation**, "*Optimization of cold plasma jet for enhancing hydrogen peroxide production and its application to wound healing*" In:,5th Asia-Pacific Conference on Plasma Physics, 26 Sept-1 Oct, 2021, Remote e-conference.

- **Oral Presentation**, "*Plasma self-organization in DC discharges with liquid anode: effect of electrode separation, liquid type and working gas*" In:, 75th Gaseous Electronics Conference Conference on Plasma Physics, 03 Oct – 06 Oct, 2022, Sendai, Japan.

- **Oral Presentation**, "*A conical plasma jet for wound-healing applications*" In:,6th Asia-Pacific Conference on Plasma Physics, 09 Oct – 14 Oct, 2022, Remote e-conference.

- **Oral Presentation**, "*Atmospheric pressure plasma jets operated by shielded and unshielded high voltage electrodes: Physicochemical characteristics and application to bacterial killing*" In:, 64th Annual Meeting of the APS Division of Plasma Physics, 17 Oct – 21 Oct, 2022, Spokane, Washington, United States.

- **Invited Talk,** "*Understanding the formation of stable and unstable cathode spots in plasma-liquid interactions*" In: 76th Gaseous Electronics Conference, 08 Oct – 13 Oct 2023, Michigan United States.

Awards

- **Young Researcher Award in Applied Physics** – from Association of Asia-Pacific Physical Societies Division of Plasma Physics (AAPPS-DPP). For more details, click here.
- **Received best poster award for:** PW-P016, "*Hydroxyl radical species generated by non-thermal direct plasma jet and their qualitative evaluation*" In: 50th Winter Annual Conference of the Korean Vacuum Society (February 17-19, 2016, Welli-Hilli Park, Gangwon, Korea).