



Universiteit
Leiden
The Netherlands

Applications of graphene in nanotechnology : 1D diffusion, current drag and nanoelectrodes

Vrbica, S.

Citation

Vrbica, S. (2018, December 12). *Applications of graphene in nanotechnology : 1D diffusion, current drag and nanoelectrodes. Casimir PhD Series*. Retrieved from <https://hdl.handle.net/1887/68258>

Version: Not Applicable (or Unknown)

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/68258>

Note: To cite this publication please use the final published version (if applicable).

Cover Page



Universiteit Leiden



The handle <http://hdl.handle.net/1887/68258> holds various files of this Leiden University dissertation.

Author: Vrbica, S.

Title: Applications of graphene in nanotechnology : 1D diffusion, current drag and nanoelectrodes

Issue Date: 2018-12-12

CURRICULUM VITAE

Sasha VRBICA

- 17-06-1986 Born in Belgrade, Serbia
- 2000 – 2004 5th Gymnasium
Belgrade, Serbia
- 2004 – 2011 BSc. in Theoretical Physics
Faculty of Physics, Belgrade, Serbia
- 2011 – 2012 MSc. in Experimental Physics
Institute of Physics, Center for Solid State Physics, Belgrade, Serbia
Thesis: Study of vibrational characteristics of CeO₂ nanocrystals
Supervisor: Prof. Dr. Zoran V. Popović
- 2013 – 2018 PhD in Experimental Physics
Leiden University, Leiden, The Netherlands
Thesis: Applications of Graphene in Nanotechnology – 1D
diffusion, Current drag and Nanoelectrodes
Supervisor: Prof. dr. Jan M. van Ruitenbeek

LIST OF PUBLICATIONS

1. A. Bellunato*, **S. Vrbica***, C. Sabater, E. W. de Vos, R. Fermin, K. N. Kannevorff, F. Galli, J. M. van Ruitenbeek and G. F. Schneider, *Dynamic tunneling junctions at the atomic intersection of two twisted graphene edges*, *Nano Lett.* **18**, 4, 2505-2510 (2018).

*These authors contributed equally to this work

2. **S. Vrbica**, T. Preis, N. Kocić, J. Repp and J. M. van Ruitenbeek, *One-dimensional diffusion of Co adatoms on graphene nanoribbons*, to be submitted.
3. **S. Vrbica**, T. Vlot and J. M. van Ruitenbeek, *Inducing voltage by moving a droplet of liquid along graphene*, to be submitted.

Patent applications

1. G. F. Schneider, J. M. van Ruitenbeek, A. Bellunato, **S. Vrbica**, C. Sabater, E. de Vos. *Method of preparing two-dimensional electrically conductive material having atomically sharp supported edges*. Patent application GB 1610187.5

ACKNOWLEDGEMENTS

I would need to write another book to properly thank all the people who were there for me during these past few years. It was challenging for me to start a new life far from everyone I knew, but you all made it so easy and so wonderful. I will cherish my PhD time in Leiden and remember it with a smile.

First and foremost, I would like to thank the most inspirational, enthusiastic and creative professor that I have come across in my lifetime: Jan van Ruitenbeek. Jan, you were always supportive, open for suggestions, available for discussions and always leaving room for creativity. Your endless patience, wisdom and enthusiasm, along with a great sense of humor motivated me to go the extra mile, every day. You taught me so much about research in general, about how to approach problems, how to remain calm and patient when facing challenges and how to make the best out of every situation. I still have a lot to learn but now I am confident I will do it much faster and better, all as a result of your guidance.

I would like to express my sincere gratitude to all our collaborators. Sander Otte, Ranko Tošković and Marnix Rebergen, thank you for giving me the opportunity to do an experiment in your lab in Delft. It was short but memorable experience. Not only did I learn a lot about STM in those few weeks, but your group created such a wonderful atmosphere that it made all the hard work very enjoyable. Amedeo Bellunato and Grégory Schneider, thank you for a very successful collaboration. I always believed that bringing chemistry and physics together is bound to offer not only interesting possibilities for experiments but also a higher chance for a good outcome. To Jascha Repp, Tobias Preis, Nemanja Kocić and all the others, I cannot thank you enough for giving me a wonderful opportunity to work in your lab in Regensburg. For a couple of months you made me feel like I was a part of your group. I enjoyed every minute of our discussions and experiments, as well as all the laughs at coffee breaks. Working in your lab is an experience that I will never forget.

I had the good fortune to cross paths with Federica Galli and Marcel Hesselberth, two people without whom I would not have gotten this far. Your vast knowledge and expertise on pretty much every subject (scientific or otherwise), mixed with a lot of humor and willingness to teach, made it an absolute pleasure to work with you. Thank you for your guidance, for all the discussions, tutoring, crisis averting (even on weekends) and for all the fun times we had. You made my research more adventurous, you challenged me to do my best and every day you made me feel like I was not far away from home.

I owe a big thank you to Elena Tartaglini for generously offering me her time and expertise in the first weeks of my PhD. It would have been a real struggle without her

help. Christian Pen, your amazing ideas, skills and experience accompanied by quick thinking and readiness to help as efficiently as possible made my research much easier and much more pleasant. Without your expertise my results would not have been half as good as they are now. To everyone in the fine mechanical department, you met all my urgent requests (even on Friday afternoons) and you always brought a good mood along with great ideas, thank you for that! Peter van Veldhuizen, Bert Crama and the rest of the electronics department, thank you for all your efforts and for always helping me out with a smile. Marije Boonstra, thank you for so many well-organized events, conferences and workshops and for always finding a solution when I would come with a problem. Wilfred van der Geest, you were always there to help out with whatever needed fixing or solving, it was very helpful knowing that everything can easily be sorted out when you are around. Ellie van Rijsewijk, Charlotte Laureense-Griffoen, Ruud Kuyvenhoven, Erik van de Kraan, Annette Bor and the rest of the staff of Leiden University and NWO, I owe you all a big thank you for your professionalism, efficiency and, all-in-all, for making my PhD much less stressful than it would otherwise have been.

I would like to thank all my students Irene, Kim, Eric, Remko, Kirsten, Theo, Jurrien and David, I truly enjoyed working with you. You made me a better teacher and I hope that, in return, I managed to spark your interest in science. Peter Gast, thank you for all your help with my teaching-assistant duties, it was enjoyable working as a TA with you. Kaveh Lahabi and Daniël Geelen, you already know everything. Just keep swimming! Carlos, it was a pleasure having you as a post doc in our group. I wish you and Mary a lot of luck with your future research and hope our paths will cross again in the future. I would like to thank Sense Jan van der Molen and Jan Aarts for all the interesting group discussions during the early stages of my PhD. I also thank Eric Eliel for his feedback and for regularly bringing my attention to useful workshops and scientific events.

My PhD days would have been bland if not for the wonderful people who were always there to brighten the day: Hasan & Huseyin, Edwin, Sumit, Tobias, Victor, Jaco, Jacob, Julian, Mike, Remco, Alexander, Daan, Anikitkat, Jaap, Jo, Vera, Chunhai, Nikita, Stefano, Luigi, Lucia, Jelmer, Gesa, Arthur, Doo, Koen, Marc, Martin, Tom, Amrita, Christian Glass, Christian Wagner, Anne France, Douwe, Timothy, Thomas, Manohar, Chris Smiet, Flavio, Biswajit, Saptaswa, Kirsten, Oliver, Jimmy, Morten, B, Pauline, Kier, Tjerk, Milan, Marcel Rost, Davide, Ignacio and many others. I will always treasure the days I spent with you in the lab, at conferences, courses and outside of work.

I would also like to thank three persons who are very special to me, my elementary school teacher Prof. Nedović, who first sparked my interest in math, and my high school professors Tanja Munižaba and Dinka Todorović. Tanja, you have given me the freedom to express my creativity, and the courage to pursue my dreams, I cannot thank you enough for that. Dinka, you are the reason why I decided to study experimental physics and why I am defending my doctorate today. Your optimism,

passion for physics, patience and willingness to share all your knowledge is what defined my life path. I would not have done any of this without you. Thank you.

I am thankful to all my Balkan PhD friends in the Netherlands: Stefan, Markeša, Marija Mučibabić, Ranko, Dejan, Darko, Miloš Birvalski, Zoki and Marina, Onder and Tanja, you all deserve pages of gratitude each. Thank you for keeping my spirits up. I enjoyed exchanging scientific knowledge and anecdotes with you, as well as Serbian humor and life stories. I wish you all a lot of success in your scientific careers and all your future endeavors. I also thank my friends in Serbia for believing in me and being there for me for more than a decade.

Lastly, I would like to thank the people closest to me, my family. Mama, tata, bako, thank you for all the effort, patience, advice, care, understanding and smiles. Grey sky always looks brighter because you are always with me. To my twin Pajce, my brother in arms, thank you for always being there for me, from day one, and for helping me through all my ups and downs. Good luck with your biology research. I hope you will get to experience the same joy and excitement that I experienced during my PhD. Vladi and Pitri, thank you for being a part of my life (Pitri, I hope you will choose physics over biology as your career when you grow up!)

Asuna, you light up the path you walk on and I was lucky to walk by your side all these years. Thank you for standing by me when I was facing challenges, and for helping me thrive in everything I do. As we now continue our adventure down the road less traveled by, I am excited to see where it will take us!