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UV Photodesorption and photoconversion of interstellar ices: the laboratory perspective

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Citation
Bulak, M. (2021, December 9). *UV Photodesorption and photoconversion of interstellar ices: the laboratory perspective*. Retrieved from https://hdl.handle.net/1887/3245781

Version:	Publisher's Version
License:	Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden
Downloaded from:	https://hdl.handle.net/1887/3245781

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

List of Publications

1. *Effect of molecular structure on the infrared signatures of astronomically relevant PAHs*
   Bouwman, J., Castellanos, P., **Bulak, M.**, Terwisscha van Scheltinga, J., Cami, J., Linnartz, H., Tielens, A. G. G. M., 2019, A&A 621, A80

2. *Novel approach to distinguish between vacuum UV-induced ice photodesorption and photoconversion. Investigation of CH_4, CH_3OH, and CH_3CN*
   Bulak, M., Paardekooper, D.M., Fedoseev, G., Linnartz, H., 2020, A&A 636, A32

3. *Gas-phase infrared spectroscopy of the rubicene cation ($C_{26}H_{14}^{\bullet+}$). A case study for interstellar pentagons.*
   Bouwman, J., Boersma, C., **Bulak, M.**, Tielens, A. G. G. M., Linnartz, H., 2020, A&A 636, A57

4. *Photolysis of acetonitrile in a water-rich ice as a source of complex organic molecules: CH_3CN and H_2O:CH_3CN ices*
   Bulak, M., Paardekooper, D.M., Fedoseev, G., Linnartz, H., A&A 647, (2021) A82

5. *Quantification of O_2 formation during UV photolysis of water ice - H_2O and H_2O:CO_2 ices*
   Bulak, M., Paardekooper, D.M., Fedoseev, G., Chuang, K.-J., Terwisscha van Scheltinga, J., Eistrup, C., Linnartz, H., A&A, in press

6. *UV photodesorption and photoconversion rates of H_2O ice - measured with laser desorption post ionization mass spectrometry*
   Bulak, M., Paardekooper, D.M., Fedoseev, G., Samarth, P., Linnartz, H., in preparation

7. *Inverse Kinetic Isotope Effect in Superdeuteration of Pentacene - A Possible Catalytic Pathway to Formation of Deuterium Enriched Interstellar Molecules*
   Simonsen, F. D. S., Banhatti, S., **Bulak, M.**, Maddii Fabiani, L., Jaganathan, R., Wenzel, G., Thrower, J.D., Hornekær, L., in preparation

8. *Experimental toolbox of MATRI^{2}CES applied to interstellar ice analogues*
   Bulak, M., Paardekooper, D.M., Fedoseev, G., Samarth, P., Bouwman, J., Chuang, K-.J., Linnartz, H., in preparation

About the author

Michał was born to Adam and Ewa Bulak on the 1st of January, 1992 in Zamość, Poland. Growing up, he spent most of the time between school and a local swimming pool. A decision to enroll into the I Społeczne Liceum Ogólnokształcące was made to accommodate for this duality. He continued to develop an inclination towards physics and mathematics as well as his passion for swimming. Upon high school graduation, both worlds, of science, and of sport, were equally exciting and promising. To continue the progress in both, he moved to the United States. At Missouri State University (MSU), he pursued a Bachelor degree in Science majoring in Applied Physics & Engineering, while being a member, and eventually a captain of a Division I swimming team. In 2015, as the swimming journey ran its course, he graduated with a Bachelor degree and science became his dominant passion, which has eventually turned into a career. Michał continued his education at MSU in the Master of Science program in Materials Science. During this period, he acquired experimental skills while working on a project with an astrophysical context. In his master's thesis he studied laboratory analogues of atmospheres of the hot rocky super-Earths. The acquired skillset combined with a thrill and satisfaction that comes from designing and running experiments, was a clear motivation to continue in this field. In 2017, Michał accepted a PhD position in the Laboratory for Astrophysics in Leiden, under supervision of Prof. dr. Harold Linnartz. The research project was focused on quantifying chemical and physical processes triggered upon an interaction of ultraviolet light with interstellar ice analogues. This thesis presents the PhD research results acquired over the last four years in Leiden. In his free time, Michał nurtures his connection to sports by coaching crossfit and weightlifting.

Acknowledgements

Looking back at the last four years at the Laboratory for Astrophysics, it seems like the time flew by. Yet, so much has happened and just as much has changed. This has been a time of personal and professional growth which are typically triggered by challenges along the way. To overcome these challenges, write this thesis, and become who I am today would not be possible without an incredible net of support from colleagues, friends and family. Here, I would like to express my gratitude and acknowledge by name those involved. If there are omissions (and there will be), please forgive me, and know it is not out of disregard.

Let me begin with taking a step back. The skills and background which made me eligible to apply for a PhD position in the first place, were largely developed during my time as a research assistant with Dr. Dave Cornelison. His message was to apply the attitude I had for swimming to science and the fun and results would follow. To this day I go by that rule, and I do not expect that will ever change. Lyle, I know you are always there. You have been an inspiration. Please don't change.

My PhD supervisor and promotor Prof. dr. Harold Linnartz made me feel welcome and placed his trust in me. Within reasonable boundaries, I had the freedom to explore the lab and work on my own terms. It took me a while to understand that this is how one becomes independent. Harold patiently forged my writing skills, which are still far from great, but believe me, I have come a long way. My co-promotor, Prof. dr. Xander Tielens. Thanks to you there was a balance between the lab and everything else. Besides invaluable scientific feedback, I truly appreciate you checking on how I was currently feeling.

Daniel, I wish our time in Leiden overlapped more. Without your support, knowledge, enthusiasm for science, and questions you asked me, I would not be able to complete all the projects. You should consider giving a course on how to efficiently work with your supervisors. Pushing the boundaries of Matrices was the most fun I had in the lab, and tuning the system to its current sensitivity was a mutually shared success. I sure hope you enjoyed it as well. Gleb, you were there along most of my journey. Multiple times, when in doubt, or too enthusiastic, you would steer me back to reason. Your bluntness, expertise and sentiment for the slavic culture made me enjoy your company while working together.

Jordy, you are a great scientist who also knows how to have fun. Please don't forget the latter. I learned tons from you, also by being around you. It would be a shame not to mention the fun we had with Pablo and Jeremiah, during and in between the FELIX shifts. I wish you and your family all the best in Colorado. Every lab scientist needs 'a martijn' - that's clear. More importantly, though, Martijn, you are a good spirit - I appreciate you, your attitude, and your passions, stay young forever.

The PhD in the lab cannot be done without a group with whom you exchange ideas, look for tools and solutions to problems, and after work, have a borrel. This

includes: Jeroen, Ko-Ju, Niels, Danna, Vincent, Kirstin, Thanja, Andreas, Marina, Sanjana, Nicolas, Yugu, Pranjal, Tara, Will, Carlos, Julia, Helgi. Pranjal, I trust that you can take care of the baby and I hope you embrace all the successes and challenges that come with it. Jeroen, you have redefined a few things for me, including, tidiness and attention to detail. I am grateful for your company during all the ups and downs of living and working together. Keep you attitude, and make sure to enjoy life.

It is impossible to be an astrochemist without a little bit of astronomy. Thank you, Ewine, for letting me join your group meetings. To the group members: Łukasz, Christian, Martijn, Sierk, Pooneh, Alice, Arthur, Merel, Alex, Benoit, thanks for coffee breaks, borrels and answering all my astronomy questions. Łukasz, together with Marta, you have been a grounding friendly Polish presence. I am cheering for you two and hoping to see you soon. Lydia, we have had a great connection since our first chat about sports. Thank you for being a patient friend. Keep growing! Dario, my companion from day one in Leiden. We went all over Europe together, we grew together, made memories for a lifetime, and we graduated (almost) together. Thank you for always being there. Cheering for you from across the big pond. Chris, how cool is that we have an article together? I hope you and Iris stick around. To all ESRs of the training network EUROPAH - what a group we are! I look back on all our trips with a big smile, and I wish you all the best along the professional and personal paths you have chosen.

Sports has opened up a lot of opportunities for me. A huge thank you to the crew from Crossfit 071 - Peter-Jan, Rob, all the coaches and friends. I owe you. You transformed the gym, from a place of excercise, to a place where I made friends and felt at home, away from home.

Mama, tata, dziękuje za wiarę we mnie i bezwarunkowe wsparcie. Nie ma mnie na miejscu, ale chcę żebyście wiedzieli że często jestem z wami myślami. Kilka lat temu, jak bylem w gimnazjum i w głowie miałem tylko pływanie, kto by pomyślał że będę robił doktorat z astrochemii? Ja na pewno nie... i wy pewnie też nie. Mimo że bez takich planów, okazało się że była to świetna przygoda. Waldi, Artur i Ania — dalej stopniowo do mnie dociera (albo już dotarło) jak ważne jest rodzeństwo i szczególna jest nasza więź. Cale szczęście że was mam, tacy przyjaciele od urodzenia. Każde z was dołożyło swoja cegiełkę. Dziadkowe i babcine mądrosci też zrobiły swoje. Pamiętam i dziekuję. Kocham was wszystkich bardzo!

At last, and the opposite of least, to my rock, Lisanne. You have brought so much energy, so much love, strength and activity to my life, I cannot see it any other way. You know it better than anyone, that you have pushed me through the last bit and supported me on all fronts, from listening to my astrochemistry presentations, to making sure that we have enough sweets to satisfy our cravings. This book is here thanks to you. Kocham Cię!

Michał Bulak