

Report on the outcomes of a Virtual Mobility¹

Action number: CA19110

Grantee name: Saeed Kooshki

Virtual Mobility Details

Title: Documentary Video Production for the Introduction of Plasma Activated Water Technology in Agricultural Applications

Start and end date: 01/10/2022 to 21/10/2022

Description of the work carried out during the VM

Description of the virtual collaboration and activities carried out during the VM, with focus on the work carried out by the grantee. Any deviations from the initial working plan shall also be described in this section.

The focus of this VM grant was to assemble a documentary video describing Plasma-Activated Water (PAW) technology in agricultural applications. I made several interviews with different researchers prominent on plasma agriculture field and participating CA19110 action. They came from scientific centers and companies from different countries that are all involved in the PAW to agriculture studies. I first got some equipment like a camera, microphone, and stand to make several interviews to use as raw material for the film.

First of all, to provide more basic information about PAW technology definition, characterization and generation in the laboratory scale, I went to the Institute of Plasma Physics of the Czech Academy of Sciences and made an interview with professor Petr Lukes and some of his group members. Also, I made some shots from his laboratories to show their plasma setup for PAW generation and their chemical analysis equipment for measurement of the Reactive Nitrogen and Oxygen Species (RONS) concentrations in PAW.

In continuation, I went to the Division of Environmental Physics, Department of Astronomy, Earth Physics and Meteorology of Comenius University in Bratislava, to make interviews with prof. Zdenko Machala, prof. Karol Hensel, and prof. Mario Janda. During these interviews, they explained the main mechanism of the interaction of plasma and water in PAW generation, the main advantages of PAW technology especially in the agricultural applications in comparison to existing ones, and the main challenges with PAW technology for future development and marketing. Also, I made some shots from their laboratory activities to show their different laboratory setups for PAW generation. For example, these setups include new high flow rate production of PAW using a Dielectric Barrier Discharge (DBD) reactor, new hybrid

¹ This report is submitted by the grantee to the Action MC for approval and for claiming payment of the awarded grant. The Grant Awarding Coordinator coordinates the evaluation of this report on behalf of the Action MC and instructs the GH for payment of the Grant.

transient spark and electrospray reactor for producing high concentrations of the RNOS in PAW, and a novel water electrode DBD reactor.

Then, I went to the Brno University of Technology - Faculty of Mechanical Engineering, CZ. to make interviews with prof. Jan Cech and prof. Pavel Rudolf. During this meeting I recorded a video from their patented PAW generator pilot with capability of bulk quantity PAW production which is probably a good candidate for making a scale-up version in the commercialization process.

Finally, I made two virtual interviews with different companies working in PAW applications. One of them was with Mr. Slawomir Moritz who is the director of the Prolinesloutions a start-up company for PAW applications in Vienna, AT. Another virtual interview was with Mr. Paul Leenders who is the director of the VitalFluid, a prominent company in PAW applications and machinery productions of the PAW technology in Eindhoven, NL. The virtual interview with Mr. Leenders was supervised with Prof. Machala. After material production I made a documentary film as the final version according the VM proposal. The size, format, and time of the film file is around 180 MB, MP4, and 20 min respectively.

Description of the VM main achievements and planned follow-up activities

Description and assessment of whether the VM achieved its planned goals and expected outcomes, including specific contribution to Action objective and deliverables, or publications resulting from the VM. Agreed plans for future follow-up collaborations shall also be described in this section.

According the VM plan activities, my plan was to make a short documentary film about PAW technology and its agricultural applications. Therefore, I booked several appointments to make interviews with different professors, young researchers, and company directors about the PAW technology. During these interviews I focused on the PAW properties, production mechanism, main advantages, and main challenges of this technology in agricultural applications. In the beginning, prof. Lukes and his colleagues at the Institute of Plasma Physics in the Prague made an introduction about the PAW technology. He illustrated the basic PAW properties and its different agricultural applications. Also, his colleagues have generated PAW using their DBD reactor in front of the camera. Then, I went to Bratislava and made interviews with prof. Machala and his colleagues to provide more information about PAW properties, its advantages in agriculture, and the main mechanism of the PAW productions. I made some shots from different plasma setups for producing PAW in different laboratory scale there. Also, they described the main challenges of the PAW technology for future development in the market. They mentioned that one of the main challenges in this way is about energy consumption optimization of PAW generation system and making a standard scale-up version for PAW generation. Then, I went to Brno to make interviews with prof. Jan Cech and his colleagues, to show their patented system which has capable to produce bulk quantity of PAW. In this part they introduced a high-potential candidate of PAW generator system for commercialization. In this system they have been used the cavitation phenomena in the fluid line to generate cold plasma in water directly and improve the PAW system energy efficiency. Then, I made two virtual interviews with two companies in the PAW technology applications in agriculture. One of them was with a start-up company in Vienna which described about huge potential in the PAW market for wastewater treatment and simultaneously producing green fertilizer in one process for agricultural applications in future. Another one was with VitalFluid company which is a well-known company from Netherlands in the PAW applications in agriculture. Its director Mr. Leenders has shared his experience in making a competitive PAW generator system for the real farm application. Finally, after editing all videos I made a short documentary film about PAW technology and its applications in agriculture which can answer some simple questions such as: what is the PAW technology definition, properties, main advantages in agriculture, and its main challenges? As the video will be shared and available on various social media and different web pages related to science and education, this will help in promoting the PAW technology to ordinary users and farmers. Comprising the interviews from the partners both from academia and industry, it will enhance and interaction with interested parties and possible users across Europe: companies, farmers, etc.