

Report on the outcomes of a Virtual Mobility¹

Action number: CA19110

Grantee name: FILIPPO CAPELLI

Virtual Mobility Details

Title: Plasma physical-chemical mechanisms of interaction with foods

Start and end date: 08/08/2023 to 20/10/2023

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.

(max. 500 words)

The main objective of the VM was to conduct a literature review to investigate the main characteristics of plasma treatments carried out in the food-industry research field. The subject under investigation is vast and constantly expanding, which is why it is not trivial to keep track of all plasma processes carried out by researchers all over the world; moreover, plasma treatments conceal within them a multitude of process operating parameters that can be varied to achieve different results.

The first stage of this VM was the selection of the pool of articles that constituted the state of the art to be analysed. To perform this search, the Scopus search engine was used, and articles were selected according to certain key characteristics: publication date (2000-2022), articles in scientific journals, articles in English and articles containing a certain list of words in the title. Before proceeding with the creation of the list of items to be analysed, COST members were asked to actively participate in this VM. By means of an e-mail, the members were asked to indicate any keywords to be added to the search and categories to be extracted from the articles; moreover, we asked them to indicate the presence of any important publications in the field to be able to check how the search query worked. Unfortunately, only a fraction of the COST members was willing to carry out this task, nevertheless the 3 contributions received were utilised.

Once the list of articles to be analysed had been created (4215 articles found), an initial selection was made to eliminate off-topic articles based on the analysis of the abstract. Articles that dealt with thermal plasmas, low-pressure plasmas, processes that were not exploited in the food sector or that only dealt with the treatment of packaging were eliminated. A reduced set of articles (738) was analysed in its entirety. From the reading of these articles, a table was constructed containing data that could be extracted from each article in terms of plasma source architecture, treatment purpose, reaction

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.

mechanisms, power supply, electrical parameters, process gas, use or non-use of liquids and treatment time. Once the table was constructed, it was possible to analyse its contents by cross-referencing the data from the different categories, with a particular interest in seeing how plasma sources are exploited depending on the type of application, or which physical mechanisms are exploited to achieve a certain result.

Following this analysis, a report was drawn to serve the scientific community to understand the most relevant areas of research related with foods, the most exploited plasma sources and the physico-chemical mechanisms associated with them.

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.

(max. 500 words)

The expected outputs from this VM were twofold: the production of a table containing data on the articles selected during the VM itself, a table that containing the main parameters of the processes exposed in the articles: architecture of the plasma source, treatment purpose, physico-chemical mechanisms, power supply, electrical parameters, process gas, use or non-use of liquids and treatment time. The second expected output was the production of a report analysing the data contained in the table, with particular interest in seeing how plasma sources are exploited according to the type of application, or which physico-chemical mechanisms are exploited to achieve a particular result. Both results were reached and are in line with the 'Technical roadmap - key food applications and standardised procedures', a document prepared by the European community working on cold atmospheric plasma food processing within the European project CA19110 Plagri (Plasma applications for smart and sustainable agriculture).

Both the table and the report will be available to the COST community to be shared and analysed; a graphical representation of key findings is present in the report to make it usable on the COST social media platforms.