This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking (now Clean Hydrogen Partnership) under grant agreement n°826097. This Joint Undertaking receives support from the European Union's Horizon 2020 Research and Innovation program, Hydrogen Europe and Hydrogen Europe Research.

GAIA

NEXT GENERATION AUTOMOTIVE MEMBRANE ELECTRODE ASSEMBLIES

Grant agreement no.: 826097
***Start date**: 01.01.2019 – **Duration**: 42 months*
***Project Coordinator**: Dr. Deborah Jones - CNRS*

DELIVERABLE REPORT

D7.4: SURVEY OF DISSEMINATION ACTIVITIES AND FINAL PLAN FOR DISSEMINATION AND EXPLOITATION OF PROJECT RESULTS		
Due Date	30 June 2022	
Author (s)	N. Cros (PXO)	
Workpackage	WP7	
Workpackage Leader	PXO	
Lead Beneficiary	PXO	
Date released by WP leader	30 June 2022	
Date released by Coordinator	10 July 2022	
DISSEMINATION LEVEL		
PU	*Public*	***X***
PP	*Restricted to other programme participants (including the Commission Services)*	
RE	*Restricted to a group specified by the consortium (including the Commission Services)*	
CO	*Confidential, only for members of the consortium (including the Commission Services)*	
NATURE OF THE DELIVERABLE		
R	*Report*	***X***
P	*Prototype*	
D	*Demonstrator*	
O	*Other*	

SUMMARY	
Keywords	*Dissemination, Impact, Communication*
Abstract	The GAIA consortium has been very active in disseminating and communicating about the project outputs throughout the duration of the project and despite the pandemic that reduced the number of conferences being held during the second period of the project. The GAIA consortium was very successful in disseminating the project results with the publication of 8 articles in peer-reviewed journals and 12 presentations at international conferences and workshops. Various target groups included industry, academia, government bodies and the public were reached, notably by numerous press releases from the partners. After the end of the project, the consortium will continue to carry out further activities to disseminate and exploit the results.
Public abstract for confidential deliverables	The GAIA consortium has been very active in disseminating and communicating about the project outputs throughout the duration of the project and despite the pandemic that reduced the number of conferences being held during the second period of the project. The GAIA consortium was very successful in disseminating the project results with the publication of 8 articles in peer-reviewed journals and 12 presentations at international conferences and workshops. Various target groups included industry, academia, government bodies and the public were reached, notably by numerous press releases from the partners. After the end of the project, the consortium will continue to carry out further activities to disseminate and exploit the results.

REVISIONS			
Version	**Date**	**Changed by**	**Comments**
0.1	30 June 2022	N. Cros	Drafted

This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking (now Clean Hydrogen Partnership) under grant agreement n°826097. This Joint Undertaking receives support from the European Union's Horizon 2020 Research and Innovation program, Hydrogen Europe and Hydrogen Europe Research.

D7.4 - SURVEY OF DISSEMINATION ACTIVITIES AND FINAL PLAN FOR DISSEMINATION AND EXPLOITATION OF PROJECT RESULTS

CONTENTS

1 INTRODUCTION

During the GAIA project, the whole consortium actively disseminated and communicated towards different target groups including industry, academia, government bodies and the public. It is important to note that the COVID-19 pandemic seriously impacted the dissemination activities, particularly the participation in conferences, with the cancellation of most in-person conferences from March 2020 until the end of the project, which explains the reduced level of conference attendances during the second period of the project.

All partners intend to continue the dissemination and exploitation of the project results after the end of the project, while continuing to respect the intellectual property rights, confidentiality, and the legitimate interests of each partner according to the Grant Agreement article II.30 and the internal dissemination protocol (D7.2).

2 DISSEMINATION & COMMUNICATION ACTIVITIES

2.1 Project website

The project website (www.gaia-fuelcell.eu) was released at M4. It provides an overview of the status and the progress of the project. The website is updated on a regular basis and includes the most relevant information like public deliverable reports, publishable summaries of confidential deliverable reports, updates on dissemination activities and other project news, which were communicated to the public and the scientific community.

The website has received more than 3000 visits, showing clear impact of the communication and dissemination actions, especially the release of newsletters and press releases and more particularly the one on the GAIA MEAs delivering a fuel cell power density of 1.8 W/cm^2 @ 0.6 V (July 2021)

At the end of the project, the GAIA website will reflect the status of the project as finished but, nevertheless, it will remain active as an information source of the all-consortium activities linked to the project and will be updated with new information like publications, reports and results which will be clearly communicated through relevant news items.

2.2 Brochure, Newsletters, Press releases and Video clip

Brochure

To assist communication from GAIA, a project brochure was edited, printed, and distributed to partners for their use when attending conference and technical fair events. This brochure is also available from the public website (PDF for download).

Newsletters

- **Newsletter issue#1 -** The printed newsletter was distributed to attendees of the EFCD2019 conference (15-18 September 2019, La Grande Motte, France) , and spread using each partner LinkedIn account (520 views). It is also available on the public website (PDF to download).
- **Newsletter issue#2** - November 2020: This newsletter is available on the PSW, the public website (PDF to download) and was spread using partner's LinkedIn account: LinkedIn post (850 views)
- **Newsletter issue#3** – October 2021: This newsletter is available on the PSW, the public website (PDF to download) and was spread using partner's LinkedIn account: LinkedIn post (more than 1900 views)

2.3 Press releases

- **FCH JU Awards 2019, Brussels, Belgium - GAIA Best Success Story**
  The 2019 FCH JU Best Success Story award: 'Driving forward fuel cell technologies' was made to a cluster of 5 projects, GAIA, CRESCENDO, VOLUMETRIQ, INSPIRE and PEGASUS.
  The successful projects reduce fuel-cell technology production costs, speed up manufacturing, and develop new materials to increase fuel cell performance. Overall, they pave the way for a world-class European fuel-

cell industry that sustains clean energy. The Awards were presented at a ceremony at the Royal Museums of Fine Arts in Brussels on 20 November 2019, attended by about 300 industry, research and EU representatives. "*EU public support is speeding forward European hydrogen and fuel cells technology. All projects exchanged materials and are using each other's outcomes (...) The stack will be competitive worldwide, strengthening European jobs and industry and increasing automotive performance*". **Deborah Jones**, coordinator of GAIA, VOLUMETRIQ and CRESCENDO projects and research director at the French National Scientific Research Council (CNRS).
>>> Website >>> Press release PDF

- **CNRS press release – July 2021**
  https://gaia-fuelcell.eu/images/CNRS_Driving_forward_European_fuel_cell_technology_rev2.pdf
- **JMFC press releases – July 2021**
  Website: https://matthey.com/en/news/2021/jm-gaia-fuel-cell-performance
  LinkedIn: https://www.linkedin.com/feed/update/urn:li:activity:6825703543404544000
  Twitter: https://twitter.com/Johnson_Matthey/status/1419938840362553349?s=20
- **Elmarco press releases**
  22 April 2021: News release on LinkedIn
  https://www.linkedin.com/feed/update/urn:li:activity:6790664096443449344
  17 July 2019: Announcement about the project launch – Website link and LinkedIn post
  22 November 2019: GAIA Fuel Cells project awarded at FCH JU – direct link
  27 January 2021: From spider combs to proton exchange membranes on INDEX™20, the world's leading nonwovens exhibition website - https://www.indexnonwovens.com/en/news/from-spider-combs-to-proton-exchange-membranes-1260?utm_campaign=INDEX%20%7C%20Newsletter%20February%20%7C%20F%C3%A9vrier%202020&utm_medium=email&utm_source=Mailjet

2.4 Video clip

In order to provide accessible and understandable information also for a non-specialist audience, TUB and TUM recorded a jointly produced video clip of a total length of 6:26 min.
The team at TUB, whose focus within GAIA is the development of advanced electrocatalysts, illustrates the various steps in catalyst synthesis and in catalyst screening via the rotating disc electrode (RDE) technique. The TUM team, focusing on catalyst integration into MEAs and diagnosing MEA performance losses, shows the various steps involved in MEA preparation and in MEA testing/diagnostics in small-active-area single-cell PEM fuel cells.
The video is part of the Deliverable 7.3. and definitely helped to attract additional attention for the GAIA project.
>>> The video is available on YouTube and the GAIA Website:

- GAIA website: https://gaia-fuelcell.eu/index.php/activities/videos
- Youtube channel: https://www.youtube.com/channel/UCF_Hj5PdYtXhHw3dYDmDNGg – 6.1K views
- Video link: https://youtu.be/0MfyS8qliUo
- TUM link: https://www.department.ch.tum.de/tec/home/
- TUB link: https://www.technischechemie.tu-berlin.de/menue/forschung/gruppe_prof_dr_p_strasser/

The GAIA project will keep on communicating on its main achievements.
In the near future, the consortium plans to:
Edit a press release about the latest stack test results will be sent to the Clean Hydrogen communication service, published on the project and partners websites and released on LinkedIn.
Release a video clip on the preparation of GAIA reinforced membranes. This second video clip will be available from the project website and from the project YouTube channel

2.5 Conference presentations

The GAIA partners have disseminated project results to the scientific community through oral and poster conferences presentations including:

23rd World Hydrogen Energy Conference, 26-30 June 2022 – Istanbul, Turkey

- TUB oral presentation: Electrocatalysis of Hydrogen Technologies, Peter Strasser

ECS Spring meeting, 29 May – 2 June 2022, Vancouver, Canada

- TUM presentation: ORR Activity and Stability of a Carbon-Supported PtxY Alloy Catalyst Evaluated in a PEM Fuel Cell, P. A. Loichet Torres, Y.-S. Li, C. Grön, T. Lazaridis, C. Liebscher, P. Watermeyer and H. A. Gasteiger

Catalysis Science & Technology 10th Anniversary Symposium - 16 - 17 November 2021, online

- CNRS presentation: Carbon-Supported Platinum-Gadolinium Nanostructures as Electrocatalysts for the Oxygen Reduction Reaction", C. A. Campos-Roldán, F. Pailloux, P.-Y. Blanchard, D. J. Jones, J. Rozière, S. Cavaliere

240th ECS Meeting, 10-14 October 2021, Orlando, USA

- TUB oral presentation: Pt Alloy Octahedral Nanoparticle Catalysts from Screening Studies to Fuel Cell Measurements, F. Dionigi, L. Pan, C. C. Weber, A. Parnière, P.-Y. Blanchard, S. Cavaliere, D. Jones, A. Martinez Bonastre, J. Sharman, P. Strasser
- JMFC presentation: Cathode catalyst layer design to enable operation beyond 1.8 W/cm^2 power density, A. Martinez Bonastre.

SFEC20, 6-9 April 2021, Murol, France

- CNRS presentation: Functionalisation of Carbon Blacks by Nitrogen Plasma Treatment for PEMFC Applications, A. Parnière, P.-Y. Blanchard, S. Cavaliere, J. Rozière, D. Jones.

German Catalysis Annual Meeting in 2021 - 16 - 19 March 2021 Online Event

- **TUB presentation:** *Ternary Pt Alloy Catalysts and Carbon Modified Supports for Low Pt Loaded Fuel Cell Cathodes*, F. Dionigi, C. C. Weber, L. Pan, A. Parnière, P.-Y. Blanchard, S. Cavaliere, D. Jones.

236th ECS Meeting, 13-17 October 2019, Atlanta, GA, USA

- JMFC Keynote: The evolution of membrane electrode assemblies for automotive applications, A. Martinez

EFCD2019, 15-18 September 2019, La Grande Motte, France

- JMFC Keynote: The labyrinth around low PGM fuel cells for the electrification of the power train, G. Spikes, A. Hodkingson, D. Fongalland, L. Smith, D. Houghton, J. Sharman and A. Martinez
- TUB poster presentation Improving the Durability of Shape-controlled Octahedral Pt Alloy Nanoparticle Catalysts for use in fuel cell cathodes, F. Dionigi, C. C. Weber, L. Pan, P. Strasser
- CNRS poster presentation: Novel ORR electrocatalyst based on Pt-RE nanoparticles supported on nitrogen functionalised porous carbon, A. Parnière, P.-Y. Blanchard, S. Cavaliere, J. Rozière and D. J. Jones

ISE 71st Annual Meeting, 30 August - 4 September 2020, Belgrade, Serbia (online conference)

- **TUM presentation**: *Synthesis of Carbon-Supported PtxY Alloy Catalyst with High ECSA – Towards Highly Active and Durable ORR Catalysts*
- **CNRS presentation**: *Functionalisation of Carbon Blacks by Nitrogen Plasma Treatment for PEMFC Applications* A. Parnière, P.-Y. Blanchard, S. Cavaliere, J. Rozière, D. Jones.

The GAIA consortium will continue to present its results obtained during the project. 2 conference presentations are already planned for July and September 2022:

Gordon Research Conference, "Integrating Theory, Synthesis, Characterization and Validation for the Advancement of Fuel Cell Research", July 24 - 29, 2022, Smithfield, RI, United States

- TUB presentation: Combining Rh surface doping and surface modified carbon support to enhance the performance of octahedral PtNi nanoparticles in cathode layers, F; Dionigi, L. Pan, A. Parnière, O. Dunseath, C. C. Weber, M. Klingenhof, P.-Y. Blanchard, S. Cavaliere, D. Jones, A. Martinez Bonastre, J. Sharman, P. Strasser

GDCH Electrochemistry 2022 27-30 September 2022, Berlin, Germany

- TUB presentation: Highly Active Seed-Mediated Synthesized Octahedral PtNi(Ir) Nanocatalysts Enhance the Performance in Proton Exchange Membrane Fuel Cell, L. Pan, F. Dionigi, J. Lu, M. Ronovsky, M. Klingenhof, E. Hornberger, A. M. Bonastre, O. Dunseath, H. Burdett, J. Sharman, P. Strasser

2.6 Publications

- Nitrogen Plasma Modified Carbons for PEMFC with Increased Interaction with Catalyst and Ionomer, A. Parnière, P.-Y. Blanchard, S. Cavaliere, N. Donzel, B. Prelot, J. Rozière, and D. J. Jones, *J. Electrochem. Soc.*, 169, Number 4, (Focus Issue on Women in Electrochemistry)
  DOI: https://doi.org/10.1149/1945-7111/ac609e - OPEN ACCESS
- *Influence of the Carbon Support on the Properties of Platinum–Yttrium Nanoalloys for the Oxygen Reduction Reaction*, C. A. Campos-Roldán, A. Parnière, N. Donzel, F. Pailloux, P.-Y. Blanchard, D. J. Jones, J. Rozière, and S. Cavaliere, ACS Appl. Energy Mater. 2022
  DOI: https://doi.org/10.1021/acsaem.1c03922
- *Enhancing the Activity and Stability of Carbon-Supported Platinum-Gadolinium Nanoalloys towards the Oxygen Reduction Reaction*, Carlos A. Campos-Roldán, F. Pailloux, P.-Y. Blanchard, D. J. Jones, J. Rozière, S. Cavaliere, *Nanoscale Adv.,* 2022,4, 26-29, Advance Article
  DOI: https://doi.org/10.1039/D1NA00740H - OPEN ACCESS
- *Advancements in cathode catalyst and cathode layer design for proton exchange membrane fuel cell,* Y. Sun, S. Polani, F. Luo, S. Ott, P. Strasser & F. Dionigi, *Nat Commun 12, 5984 (2021).*
  DOI: https://doi.org/10.1038/s41467-021-25911-x - OPEN ACCESS
- *Rational Design of Carbon-Supported Platinum–Gadolinium Nanoalloys for Oxygen Reduction Reaction,* Carlos A. Campos-Roldán, F. Pailloux, P.-Y. Blanchard, D. J. Jones, J. Rozière, S. Cavaliere., *ACS Catal*. 2021, 11, 13519–13529
  DOI: https://doi.org/10.1021/acscatal.1c02449
- Seed-Mediated Synthesis and Catalytic ORR Reactivity of Facet-Stable, Monodisperse Platinum Nano-Octahedra, Elisabeth Hornberger, Valentina Mastronardi, R. Brescia, P. Paolo P., M. Klingenhof, F. Dionigi, M. Moglianetti, and P. Strasser, *ACS Appl. Energy Mater.,* 2021
  DOI : https://doi.org/10.1021/acsaem.1c01696
- Design and Validation of a Fluidized Bed Catalyst Reduction Reactor for the Synthesis of Well-Dispersed Nanoparticle Ensembles, E. Hornberger, H. Schmies, B. Paul, S. Kühl and . Strasser, J. Electrochem. Soc. 167 114509, 2020
  DOI: https://doi.org/10.1149/1945-7111/aba4eb
- Current challenges related to the deployment of shape-controlled Pt alloy oxygen reduction reaction nanocatalysts into low Pt-loaded cathode layers of proton exchange membrane fuel cells, L. Pan, S. Ott, F. Dionigi and P. Strasser, *Current Opinion in Electrochemistry* 2019, 18:61–71
  DOI: https://doi.org/10.1016/j.coelec.2019.10.011

The GAIA partners will continue to publish results obtained during the project.

2.7 Networking

FCH JU PEMFC development workshop, 5-6 March 2019, Marseille, France

- GAIA presented a poster on the project objectives during the workshop organised by the INSPIRE project hosted in Marseille on 5th-6th March 2019. This workshop convened several FCH JU H2020 projects focused on PEM fuel cell components for project presentations, discussions and poster sessions.

3 MAXIMISING IMPACT

BMW has obtained valuable inputs from the GAIA project by achieving the required performance and durability targets. BMW sees the potential in the GAIA MEAs with PBI reinforced membranes during the durability test and will accompany future material developments of the MEAs suitable for high temperature operation conditions. The optimised operation conditions, durability test protocols, and developed operation strategies obtained in GAIA project will be applied at BMW, and further developed for the next generation fuel cell automotive projects. The in-situ and ex-situ analysis methods in the GAIA project will be utilized by BMW as insightful tools to assess the MEAs condition in BMW fuel cells. BMW will exploit the results from the project not only in a short stack level but also in fuel cell system level.

4 CONCLUSION

WP7 has completed the required tasks and deliverables as described in the Description of Work. GAIA has been successful in publishing in international journals of high standing, and in presenting its results in international conferences.
Nevertheless, during the second period of the project, the consortium dissemination activities were seriously impacted by the COVID-19 pandemic, with all conferences from March 2020 until the end of the project having been cancelled or postponed. This situation has notably impacted the number of conference attendances but also the possibility to conduct face-to-face progress meetings.

The partners will continue to ensure dissemination and communication actions from the latest results obtained. This will be achieved through:

- *An update of the public website: information on published papers, reports and final results will be communicated through relevant news items.*
- *Press release*
- *Video clip*
- *Publications in peer-reviewed journals*
- *Presentation at conferences*

Finally, partners will undertake all the necessary measures to exploit the project results, through further research and development activities.