

DR. NEJC HODNIK

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Curriculum Vitae

National Institute of Chemistry, Ljubljana, Slovenia
Department of Catalysis and Chemical Reaction Engineering
Hajdrihova 19, 100 Ljubljana, Slovenia
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Place and date of birth: Ljubljana, 8th of April 1981

Nationality: Slovenian

Marital status: Married

MAIN INTERESTS

PEM Fuel cells and Electrolyzers, Electrocatalysis and Corrosion, Electron Microscopy, PGM Recycling, Development of advanced electrochemical investigation techniques, ...

EDUCATION AND EMPLOYMENT

Apr 2016 – ...	Researcher National Institute of Chemistry, Ljubljana, Slovenia Laboratory of Catalysis and Chemical Reaction Engineering Head: Prof. Dr Blaz Likozar <i>Project: Electrocatalysis: PEM Fuel Cells and Electrolyzers, PGM recycling, CO₂ reduction, ...</i>
Apr 2014 – Mar 2016	Marie Curie Intra-European fellow Max Planck Institute for Iron Research GmbH, Düsseldorf, Germany Interface Chemistry and Surface Engineering, Electrocatalysis group Scientist in charge: Dr Karl Mayrhofer <i>Project: Development of electrochemical water based in-situ TEM and study of platinum based nanoparticles potential- and time-dependent changes</i>
Jun 2013 – Feb 2014	Post-doctoral researcher National Institute of Chemistry, Ljubljana, Slovenia Laboratory of Catalysis and Chemical Reaction Engineering Head: Prof. Dr Janez Levec, Supervisor: Dr. Stanko Hočevar <i>Project: Optimisation of PtCu PEM FC electrocatalyst</i>
Mar 2013 – Jun 2013	Post-doctoral researcher Centre of Excellence for Low-Carbon Technologies, Ljubljana, Slovenia Director: Prof. Dr Miran Gaberšček <i>Project: Optimisation of PtCu PEM FC electrocatalyst</i>
Oct 2010 – May 2011	Visiting PhD Student Max Planck Institute for Iron Research GmbH, Düsseldorf, Germany Interface Chemistry and Surface Engineering, Electrocatalysis group Scientist in charge: Dr Karl Mayrhofer <i>Project: Characterization of Pt-alloy electrocatalyst with RDE and IL-TEM</i>
Oct 2008 – Mar 2013*	PhD student National Institute of Chemistry, Ljubljana, Slovenia Laboratory of Catalysis and Chemical Reaction Engineering Supervisor: Dr. Stanko Hočevar Date of defense: 31.5.2013

*aside from the first year of my PhD study

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<i>I was employed through a Slovenian research agency (ARRS) project</i>	<i>Thesis: Activity and stability of platinum alloy nanoparticles as catalysts for fuel cell reactions</i>
May 2008 – Sep 2009*	Research fellow National Institute of Chemistry, Ljubljana, Slovenia Laboratory of Catalysis and Chemical Reaction Engineering Head: Prof. Dr. Janez Levec, Supervisor: Dr. Stanko Hočevar <i>Project: European Project APOLLON-B in 6th EU FP (NMP3-CT-2006-033228): Polymer Electrolytes and Non-Noble Metal Electrocatalysts for High Temperature PEM Fuel Cells</i>
Oct 2006 – April 2008	Occasional undergraduate student volunteer work National Institute of Chemistry, Ljubljana, Slovenia Laboratory for Materials Electrochemistry Head: Prof. Dr. Janko Jamnik
Sep 2001 – Sep 2009	Undergraduate student of Chemistry Faculty of Chemistry and Chemical Technology University of Ljubljana, Slovenia Laboratory of Analytical Chemistry <i>Thesis: Oxygen reduction reaction activity measurement of Pt catalyst with microelectrode</i> Supervisor: Prof. Dr. Boris Pihlar
FELLOWSHIPS, AWARDS AND HONORS	
Oct. 2016	EIT Climate-KIC Accelerator Slovenia 2016 Finalist
Sep. 2016	Falling Walls Lab Ljubljana 2016 winner with the idea of 'Breaking the Wall of hazardous noble metal recycling'
May. 2016	Member of ESSEM COST Action ES1407 European network for innovative recovery strategies of rare earth and other critical metals from electric and electronic waste (ReCrew); 2014-2019
April 2014 – Mar 2014	Marie Curie Intra-European fellow (score 97.10/100) Value: 168,794.40 EUR At Max Planck Institute for Iron Research GmbH, Düsseldorf, Germany Interface Chemistry and Surface Engineering, Electrocatalysis group, Scientist in charge: Dr. Karl Mayrhofer <i>Project: Development of electrochemical water based in-situ TEM and study of platinum based nanoparticles potential- and time-dependent changes</i>
Sep 2013 – 21 months	Declined due to commitment above! Slovenian call "for promotion of scientists in early career" Value: 85,344.00 EUR At National Institute of Chemistry, Ljubljana, Slovenia Laboratory for Materials Electrochemistry, Head: Prof. Dr. Miran Gabršček <i>Project: Development of a new catalyst for dimethyl ether electro-oxidation for fuel cell application: mechanism, synthesis and testing</i>
Oct 2010 – 6 months	The Slovene Human Resources and Scholarship Fund: "research collaborations of Slovenian PhD students abroad" Value: 5,000.00 EUR

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	At Max Planck Institute for Iron Research GmbH, Düsseldorf, Germany Interface Chemistry and Surface Engineering, Electrocatalysis group, Scientist in charge: Dr. Karl Mayrhofer <i>Project: Characterization of the activity and stability of alloy nanocatalysts for the application in PEMFC: IL-TEM study</i>
Oct 2010 – 6 months	Max-Planck fellowship Value: 2,400.00 EUR At Max Planck Institute for Iron Research GmbH, Düsseldorf, Germany Interface Chemistry and Surface Engineering, Electrocatalysis group, Scientist in charge: Dr. Karl Mayrhofer <i>Project: Characterization of the activity and stability of alloy nanocatalysts for the application in PEMFC: IL-TEM study</i>
2014	Back Cover in PCCP special issue on “Electrocatalysis- fundamental insights for sustainable energy” HODNIK, Nejc* , JEYABHARATHI, Chinnaiyah, MEIER, C. Josef, KOSTKA, Aleksander, PHANI, L.N. Kanala, REČNIK, Aleksander, BELE, Marjan, HOČEVAR, Stanko, GABERŠČEK, Miran* and MAYRHOFER, J.J. Karl*. <i>Effect of ordering of PtCu₃ nanoparticle structure on the activity and stability for the oxygen reduction reaction.</i> PHYS. CHEM. CHEM. PHYS. , 2014, vol. 16, pp. 13610-13615.
2015	Front Cover in CHEMELECTROCHEM special issue on “In Situ Monitoring of Fuel Cell and Battery Processes” CHEREVKO*, Serhiy, KEELEY, P. Gareth, GEIGER, Simon, ZERADJANIN, R. Aleksandar, HODNIK, Nejc , KULYK, Nadiia and MAYRHOFER, J.J. Karl*. <i>Dissolution of Platinum in the Operational Range of Fuel Cells.</i> CHEMELECTROCHEM , 2015, pp. 1-9.

PUBLICATIONS: 27 articles, 12 as 1st author, 19 as corresponding author

- 1) **HODNIK, Nejc***, BALDIZZONE Claudio, POLYMEROS, George, GEIGER, Simon, GROTE, Jan-Philipp, CHERECKO, Serhiy, MINGERS, Andrea, ZERADJANIN, Aleksandar, MAYRHOFER, Karl.
Platinum recycling going green via induced surface potential alteration enabling fast and efficient dissolution.
Nature Communications, 2016, vol. 7, pp. 13164.
- 2) MEZZAVILLA, Stefano, BALDIZZONE Claudio, SWERTZ, Ann-Christin, **HODNIK, Nejc**, PIZZUTILO, Enrico, POLYMEROS, George, KEELEY, Gareth, KOSSALLA, Johannes, HEGGEN, Marc, MAYRHOFER*, Karl, SCHUTH, Ferdi*.
Structure–Activity–Stability Relationships for Space-Confined Pt_xNi_y Nanoparticles in the Oxygen Reduction Reaction.
ACS CATALYSIS, 2016, vol. 6, pp 8058–8068.
- 3) **HODNIK, Nejc***, DEHM, Gerhard, MAYRHOFER, Karl.
Importance and challenges of electrochemical in situ liquid cell electron microscopy for energy conversion research.
Accounts of chemical research. 2016, vol. 49, iss. 9, pp. 2015-2022.
- 4) JOVANOVIČ, Primož*, ŠELIH, Vid Simon, ŠALA, Martin, HOČEVAR, Samo B., PAVLIŠIČ, Andraž, GATALO, Matija, BELE, Marjan, RUIZ-ZEPEDA, Francisco, ČEKADA, Miha, **HODNIK, Nejc***, GABERŠČEK, Miran*.

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- Electrochemical in-situ dissolution study of structurally ordered, disordered and gold doped PtCu₃ nanoparticles on carbon composites***
Journal of Power Sources, 2016, vol. 327, pp. 675-680.
- 5) PAVLIŠIČ, Andraž, JOVANOVIČ, Primož, Vid Simon, ŠALA, Martin, BELE, Marjan, DRAŽIČ, Goran, ARČON, Iztok, HOČEVAR, Samo B., KOKALJ, Anton, **HODNIK, Nejc** and GABERŠČEK, Miran*.
Atomically resolved dealloying of structurally ordered Pt nanoalloyas oxygen reduction reaction electrocatalyst.
ACS CATALYSIS, 2016, vol. 6, pp. 5530–5534.
- 6) JOVANOVIČ, Primož*, ŠELIH, Vid Simon, ŠALA, Martin, HOČEVAR, Samo B., RUIZ-ZEPEDA, Francisco, **HODNIK, Nejc***, BELE, Marjan, GABERŠČEK, Miran*.
Potentiodynamic dissolution study of PtRu/C electrocatalyst in the presence of methanol.
Electrochimica Acta, 2016, vol. 211, pp. 851-859
- 7) GATALO, Matija, JOVANOVIČ, Primož*, POLYMEROS, George, GROTE, Jan-Phillip, PAVLIŠIČ, Andraž, RUIZ-ZEPEDA, F., ŠELIH, Vid Simon, ŠALA, Martin, HOČEVAR, Samo B., BELE, Marjan, MAYRHOFER, Karl, **HODNIK, Nejc***, GABERŠČEK, Miran*.
Positive effect of surface doping with Au on the stability of Pt-based electrocatalysts.
ACS CATALYSIS, 2016, vol. 6, pp. 1630-1634.
- 8) JOVANOVIČ, Primož, PAVLIŠIČ, Andraž, BELE, Marjan, **HODNIK, Nejc***, GABERŠČEK, Miran*.
Evaluation of oxygen reduction activity of non-ideal Pt based catalyst thin films.
ECS transactions, 2015, vol. 68, iss. 3, pp. 141-152.
- 9) BALDIZZONE, Claudio*, GAN, Lin, **HODNIK, Nejc**, KEELEY, P. Gareth, KOSTKA, Aleksander, HEGGEN Marc, STRASSER, Peter, Karl J. J. Mayrhofer.
Stability of Dealloyed Porous Pt/Ni Nanoparticles.
ACS CATALYSIS, 2015, vol. 5, pp. 5000–5007.
- 10) CHEREVKO*, Serhiy, KEELEY, P. Gareth, GEIGER, Simon, ZERADJANIN, R. Aleksandar, **HODNIK, Nejc**, KULYK, Nadiia and MAYRHOFER, J.J. Karl*.
Dissolution of Platinum in the Operational Range of Fuel Cells.
CHEMELECTROCHEM special issue on “In Situ Monitoring of FuelCell and Battery Processes”, 2015, pp. 1-9.
- 11) **HODNIK, Nejc***.
Multielectrode Teflon electrochemical nanocatalyst investigation system.
METHODSX, 2015, vol. 2, pp. 204-210.
- 12) **HODNIK, Nejc***, BALDIZZONE, Claudio, Serhiy, CHEREVKO, ZERADJANIN, R. Aleksandar, MAYRHOFER, J.J. Karl*.
The Effect of the Voltage Scan Rate on the Determination of the Oxygen Reduction Activity of Pt/C Fuel Cell Catalyst.
ELECTROCATALYSIS, 2015, vol. 6, iss. 3, pp. 237-241.
- 13) **HODNIK, Nejc***, JOVANOVIČ, Primož, PAVLIŠIČ, Andraž, JOZINOVIČ, Barbara, ZORKO, Milena, BELE, Marjan, ŠELIH, Vid Simon, ŠALA, Martin, HOČEVAR, Samo B., GABERŠČEK, Miran*.
New Insights into Corrosion of Ruthenium and Ruthenium-oxide Nanoparticles in Acidic Media.
THE JOURNAL OF PHYSICAL CHEMISTRY C, 2015, vol. 119, iss. 18, pp. 10140-10147.
- 14) BALDIZZONE, Claudio*, MEZZAVILLA, Stefano, **HODNIK, Nejc**, ZERADJANIN, R. Aleksandar, KOSTKA, Aleksander, SCHÜTH, Ferdi and MAYRHOFER, J.J. Karl.
Activation of carbon-supported catalysts by ozonized acidic solutions for the direct implementation in (electro-)chemical reactors.
CHEMICAL COMMUNICATIONS, 2015, vol. 51, iss. 7, pp. 1226-1229.

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- 15) HODNIK, Nejc*. ***The Role of Water-Surface Interactions of Platinum Based Catalysts in Electrochemical Methanol Oxidation.***
CHEMICAL ENGINEERING TRANSACTIONS, 2014, vol. 41, pp. 19-24.
- 16) BELE, Marjan, JOVANOVIČ, Primož, PAVLIŠIČ, Andraž, JOZINOVIČ, Barbara, ZORKO, Milena, REČNIK, Aleksander, Elena TCHERNYCHOVA, HOČEVAR, Stanko, HODNIK, Nejc*, GABERŠČEK, Miran*. ***A highly active PtCu₃ intermetallic core-shell, multilayered Pt-skin, carbon embedded electrocatalyst produced by a scale-up sol-gel synthesis.***
CHEMICAL COMMUNICATIONS, 2014, vol. 50, iss. 86, pp. 13124-13126.
- 17) HODNIK, Nejc*, JOZINOVIČ, Barbara, ZORKO, Milena and GABERŠČEK, Miran. ***Stability of Commercial Pt/C Low Temperature Fuel Cell Catalyst: Electrochemical IL-SEM Study.***
ACTA. CHIM. SLOV., 2014, vol. 61, pp. 280-283.
- 18) HODNIK, Nejc*, JEYABHARATHI, Chinnaiyah, MEIER, C. Josef, KOSTKA, Aleksander, PHANI, L.N. Kanala, REČNIK, Aleksander, BELE, Marjan, HOČEVAR, Stanko, GABERŠČEK, Miran* and MAYRHOFER, J.J. Karl*. ***Effect of ordering of PtCu₃ nanoparticle structure on the activity and stability for the oxygen reduction reaction.***
PHYS. CHEM. CHEM. PHYS. special issue on "Electrocatalysis- fundamental insights for sustainable energy", 2014, vol. 16, pp. 13610-13615.
- 19) ZORKO, Milena, JOZINOVIČ, Barbara, BELE, Marjan, HODNIK, Nejc*, GABERŠČEK, Miran. ***SEM method for direct visual tracking of nanoscale morphological changes of platinum based electrocatalysts on fixed locations upon electrochemical or thermal treatments.***
ULTRAMICROSCOPY, 2014, vol. 140, pp 44-50.
- 20) PAVLIŠIČ, Andraž, JOVANOVIČ, Primož, ŠELIH, Vid Simon, ŠALA, Martin, HODNIK, Nejc*, HOČEVAR, Samo B., GABERŠČEK, Miran*. ***The influence of chloride impurities on Pt/C fuel cell catalyst corrosion.***
CHEMICAL COMMUNICATIONS, 2014, vol. 50, iss. 28, pp. 3732-3734.
- 21) JOVANOVIČ, Primož, PAVLIŠIČ, Andraž, ŠELIH, Vid Simon, ŠALA, Martin, HODNIK, Nejc*, BELE, Marjan, HOČEVAR, Samo B., GABERŠČEK, Miran*. ***New insight into platinum dissolution from nanoparticulate platinum-based electrocatalysts using highly sensitive in situ concentration measurements.***
CHEMCATCHEM, 2014, vol. 6, i. 2, pp. 449-453.
- 22) JEYABHARATHI, Chinnaiyah, HODNIK, Nejc, BALDIZZONE, Claudio, MEIER, C. Josef, HEGGEN, Marc, PHANI, L.N. Kanala, BELE, Marjan, ZORKO, Milena, HOČEVAR, Stanko* and MAYRHOFER, J.J. Karl*. ***Time evolution of the stability and oxygen reduction reaction activity of PtCu/C nanoparticles.***
CHEMCATCHEM special issue on "ADVANCED MICROSCOPY FOR CATALYSIS", 2013, vol. 5, i. 9, pp. 2627-2635.
- 23) HODNIK, Nejc*, ZORKO, Milena, JOZINOVIČ, Barbara, BELE, Marjan, DRAŽIČ, Goran, HOČEVAR, Stanko, GABERŠČEK, Miran*. ***Severe accelerated degradation of PEMFC platinum catalyst: a thin film IL-SEM study.***
ELECTROCHEMISTRY COMMUNICATIONS, 2013, vol. 30, pp. 75-78.
- 24) HODNIK, Nejc, BELE, Marjan, HOČEVAR, Stanko*. ***New Pt-skin electrocatalysts for oxygen reduction and methanol oxidation reactions.***
ELECTROCHEMISTRY COMMUNICATIONS, 2012, vol. 23, pp. 125-128.

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- 25) **HODNIK, Nejc***, ZORKO, Milena, BELE, Marjan, HOČEVAR, Stanko, GABERŠČEK, Miran. *Identical location scanning electron microscopy : a case study of electrochemical degradation of PtNi nanoparticles using a new nondestructive method.* **THE JOURNAL OF PHYSICAL CHEMISTRY. C, Nanomaterials and interfaces**, 2012, vol. 116, no. 40, pp. 21326-21333.
- 26) **HODNIK, Nejc***, BELE, Marjan, REČNIK, Aleksander, ZABUKOVEC LOGAR, Nataša, GABERŠČEK, Miran, HOČEVAR Stanko, *Enhanced oxygen reduction and methanol oxidation reaction activities of partially ordered PtCu nanoparticles.* **ENERGY PROCEDIA**, 2012, vol. 29, pp. 208-215.
- 27) STRMČNIK, Dušan*, **HODNIK, Nejc**, HOČEVAR, Samo B., VLIET, D. van der, ZORKO, Milena, STAMENKOVIC, Vojislav, PIHLAR, Boris, MARKOVIC, Nenad M. *Novel method for fast characterization of high-surface-area electrocatalytic materials using a carbon fiber microelectrode.* **THE JOURNAL OF PHYSICAL CHEMISTRY. C, Nanomaterials and interfaces**, 2010, vol. 114, no. 17, pp. 2640-2644.

PATENTS AND PATENT APPLICATIONS

HODNIK, Nejc, BALDIZZONE, Claudio, MAYRHOFER, J.J. Karl. '*Verfahren zur Gewinnung von Edelmetallen*', German Patent Application, 27.10.2015, App. Nu. 10 2015 118279.3

BELE, Marjan, GABERŠČEK, Miran, KAPUN, Gregor, **HODNIK, Nejc**, HOČEVAR, Stanko. *Electrocatalytic composite(s), associated composition(s), and associated process(es)* : patent : US 9147885 (B2), 2015-09-29. Alexandria: United State Patent and Trademark Office, 2015. 31 p., ilustr.

Filed also as EP2735044A2, WO2013012398A2, WO2013012398A3, Japanese patent granted!

MENTORSHIP AND SUPERVISION

PhD students: JOVANOVIČ Primož, PAVLIŠIČ Andraž, BALDIZZONE Claudio, POLYMEROS George, PIZZUTILLO Enrico, VANRENTERGHEM, Bart

Bachelor students: JOZINOVIĆ Barbara, GATALO Matija

INVITED LECTURES

- 1) **HODNIK, Nejc**, BALDIZZONE, Claudio, POLYMEROS, George, DEHM, Gerhard, MAYRHOFER, Karl. *Identical location and in-situ electron microscopy study of electrocatalyst degradation: 4th International Conference on Advanced Electron Microscopy for Catalysis and Energy Storage Materials, EMCat*, Berlin, January 2016.
- 2) **HODNIK, Nejc**. *Case studies of PEM fuel cell and electrolyzer catalysts degradation* : lecture at the **Fritz Haber Institute of the Max Planck Society Department of Inorganic Chemistry**, Berlin, 4. 12. 2015.
- 3) **HODNIK, Nejc**, BELE, Marjan, HOČEVAR, Stanko. *Towards better understanding of alloyed Pt-transition metal catalysts functioning in PEMFC relevant reactions.*

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V: HACKER, Viktor (ur.). **Advanced studies of polymer electrolyte fuel cells : 5th International Summer School, TU Graz, September 3rd-7th, 2012.** Graz

4) **HODNIK, Nejc**, HOČEVAR, Stanko.

Design of platinum based catalysis for PEM fuel cell : lecture at the Department of Interface Chemistry and Surface Engineering at the Max-Planck-Institut für Eisenforschung in Düsseldorf, August 2010.

LETTERS OF RECOMMENDATION

Upon request.