

Prospective supervisor's form

Name of the supervisor: Anna Zielińska-Jurek

Academic title: PhD. DSc. Eng.

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Faculty of Chemistry

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Discipline: chemical sciences [NCh] materials engineering [IMa]

Optional

Key words (obligatory four key words describing research interests / expertise):

photocatalysis

nanocomposites

magnetic photocatalysts

nanostructures

Bibliometric indicators

1. Number of journal publications in WoS/ Scopus 28/30

2. Citations excluding self-citations WoS 860 Scopus 860

3. Hirsch index WoS 13 Scopus 14

1. The number of PhD students who have graduated under your supervision: 2

2. The number of PhD students currently supervised:

a. within the current doctoral school 0

b. within doctoral studies (previous system) 5

3. Are you currently accepting new PhD students:

a. Polish Yes/No Yes

b. Foreign Yes/No Yes

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Research interests or topics offered for PhD research (no more than 2000 characters)ⁱⁱ

Heterogeneous photocatalysis is highly appreciated for removal of organic contaminants of emerging concern from gas and aqueous phase, since under specific conditions reactive oxygen species are generated in-situ. The capacity of chemical treatment processes targeting non-biodegradable compounds to increase their biodegradability by for instance a strong oxidant attack is the most efficient combination. Therefore, photocatalysis is an alternative or synergetic process for biological degradation. At present, the need to develop ecologically clean solar-induced chemical processes, such as photocatalysis, are limited by low quantum efficiencies. Among various efforts to extend photocatalytic activity special attention is focused on the design of morphology and microstructure of semiconductor material during preparation procedure in order to achieve enhanced photodegradation of persistent organic pollutants.

In this regard, to enhance the performance of semiconductor, a suitable architecture, which integrates the usually incompatible features of large specific surface area, high charge-carrier mobility, low electron-hole recombination rate, is highly demanded.

The work in the research team of photocatalysis focuses on recent progress and developments in design, synthesis and properties of highly functional nanostructured photocatalysts. Furthermore, research into understanding the mechanism of photocatalytic degradation of persistent organic pollutants, processing–structure–property relationship will be important subjects of the PhD studies.

Potential topics include, but are not limited to:

1. Photocatalysts with different morphologies like nanocrystals, nanopores, and hierarchical structure
2. Doped or composite nanomaterials for photocatalysis
3. Self-doped semiconductors for photocatalysis
4. Various photocatalytic applications like water splitting, pollutant removal, CO₂ reduction, and useful products synthesis
5. Both experimental and theoretical results

Funding or special equipment needed to carry out a PhD project ⁱⁱⁱ:

1. Is funding available for experimental work: *Yes/No/not needed*

Yes

2. Is the equipment needed to complete a PhD project

available in your lab/department: *Yes/No/not needed*

Yes

Most important publicatio no more than 5 published after 1.01.2018

No	Authors/title/journal	Number of points according to the current list of the Ministry of Science and Higher Education	Publication year
1.	E. Mrotek, S. Dudziak, I. Malinowska, D. Pelczarski, Z. Ryżyńska, A. Zielińska-Jurek, Improved degradation of etodolac in the presence of core-shell ZnFe ₂ O ₄ /SiO ₂ /TiO ₂ magnetic photocatalyst, <i>Science of the Total Environment</i> 724 (2020) 138167	200	2020
2.	A. Sulowska, I. Wysocka, D. Pelczarski, J. Karczewski, A. Zielińska-Jurek, Hybrid TiO ₂ –polyaniline photocatalysts and their application in building gypsum plasters, <i>Materials</i> (2020), 13, 1516, doi:10.3390/ma13071516	140	2020

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3.	I. Wysocka, A. Markowska-Szczupak, P. Szweda, J. Ryl, M. Endo-Kimura, E. Kowalska, G. Nowaczyk, A. Zielińska-Jurek, Gas-phase removal of indoor volatile organic compounds and airborne microorganisms over mono- and bimetal-modified (Pt, Cu, Ag) titanium(IV) oxide nanocomposites. <i>Indoor Air</i> , 29 (2019) 979-992	140	2019
4.	I. Wysocka, E. Kowalska, J. Ryl, G. Nowaczyk, A. Zielińska-Jurek, Morphology, photocatalytic and antimicrobial properties of TiO ₂ modified with mono- and bimetallic copper, platinum and silver nanoparticles, <i>Nanomaterials</i> , 9 (2019), doi:10.3390/nano9081129	70	2019
5.	A. Zielińska-Jurek, Z. Wei, M. Janczarek, I. Wysocka, E. Kowalska, Size-controlled synthesis of Pt particles on TiO ₂ surface: Physicochemical characteristic and photocatalytic activity, <i>Catalysts</i> , 9 (11) 940 (2019), doi: 10.3390/catal9110940	100	2019

Most recent externally funded projects you were involved in – no more than 3

No	Project title, the name of the Principal Investigator (PI) and the institution the project was carried out	Years	Role in the project ^{iv}
1.	Design, synthesis, and physicochemical characterization of 2D nanosheet-based hybrid photocatalysts for degradation of pharmaceuticals, Anna Zielińska-Jurek - Principal Investigator, National Science Center	2019-2022	PI
2.	Studies on preparation, physicochemical characterization of TiO ₂ nanocomposites based on spinel and hexagonal ferrites for oxidation of organic compounds in the aqueous phase, Anna Zielińska-Jurek - Principal Investigator, National Science Center	2017-2019	PI
3.	New photocatalysts for environmentally friendly recycling of water in the production of hydrocarbons, Anna Zielińska-Jurek - Principal Investigator, Polish-Norwegian Research Programme (Small Grant Scheme) operated by the National Centre for Research and Development	2013-2017	PI

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Additional relevant information – (no more than 1600 characters)^v



ⁱ You may select up to two disciplines out of 12 disciplines represented in the Doctoral School

ⁱⁱ Observe the limit of not more than 2000 characters

ⁱⁱⁱ Leave only one answer

^{iv} Select the role in the project: PI stands for principal investigator (refers to the holder of an independent grant and the lead researcher for the grant project), Co-I for co-investigator (Co-I assists the principal investigator in the management and leadership of the research project), R for researcher

^v Add any other relevant information e.g. awards for PhD students whom you supervised (no more than 1600 characters)