Summary of professional accomplishments

Agnieszka Ubowska PhD Eng.

West Pomeranian University of Technology, Szczecin
Faculty of Maritime Technology and Transport

Szczecin, 2019

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1. Name and Surname

Agnieszka Ubowska

2. Diplomas and scientific degrees

Title: **master degree in engineering**

Year of obtaining: **2003**

Technical University of Szczecin, Faculty of Chemical Technology and Engineering

Course of studies: Environmental Protection

Specialty: Technologies of environmental protection and ecological materials;

Thesis title: *Solvent-free UV-crosslinked pressure-sensitive adhesives based on polyacrylate*

Place of implementation: Technical University of Szczecin, Faculty of Chemical Technology and Engineering, Polymer Institute

Supervisor: prof. dr hab. inż. Zbigniew Czech

Scientific degree: doctor of technical sciences

Year of obtaining: **2008**

Technical University of Szczecin, Faculty of Chemical Technology and Engineering, Polymer Institute

Scientific discipline: Chemical technology

Specialty: Polymer technology

The title of the doctoral dissertation: *Hybrid hydrophilic (co) polymers of acrylamide*;

Supervisor : prof. dr hab. inż. Tadeusz Spychaj

External reviewer: prof. dr hab. Bożena Kolarz, Wroclaw University of Science and Technology

Internal reviewer: prof. dr hab. inż. Zbigniew Czech, Technical University of Szczecin

The PhD thesis was awarded by the decision of the Council of the Faculty of Chemical Technology and Engineering of the Technical University of Szczecin.

Pedagogical Study

Year of graduation: **2002**

Technical University of Szczecin

3. Information on employment in research institutions

After obtaining the scientific degree of doctor of technical sciences, I was employed at the West Pomeranian University of Technology in Szczecin, where continue working to this day. I held the following positions, taking into account the changes in the names and the transformation of the institution:

Since 24.09.2015 – present	Assistant Professor, Head of the Safety Engineering Team, Department of Safety and Power Engineering, Faculty of Maritime Technology and Transport, West Pomeranian University of Technology, Szczecin.
01.09.2013 – 23.09.2015	Assistant Professor, Institute of Safety Engineering, Department of Safety and Power Engineering, Faculty of Maritime Technology and Transport, West Pomeranian University of Technology, Szczecin;
28.03.2011 – 30.08.2013	Assistant Professor, Institute of Safety Engineering, Department of Ship Safety Engineering, Faculty of Maritime Technology and Transport, West Pomeranian University of Technology, Szczecin;
01.12.2009 – 27.03.2011	Assistant Professor, Institute of Safety Engineering, Department of Ship Safety Engineering, Faculty of Maritime Technology, West Pomeranian University of Technology, Szczecin;
01.04.2008 r. – 31.10.2008 r.	senior technical assistant, Polymer Institute, Faculty of Chemical Technology and Engineering, Technical University of Szczecin.

4. Indication of the scientific achievement obtained after receiving the doctoral degree, constituting a significant contribution to the development of the discipline Machine Design and Maintenance

4.1. The title of scientific achievement

My scientific achievement constituting the basis for the habilitation application resulting from Art. 16.2 of the Law on Scientific Degrees and Titles, and Titles in Arts of 14 March 2003 (JoL no. 65 item 595 as amended) is a monothematic series of publications entitled:

Innovative polymer materials intended for use in technological machine guards.

It includes a habilitation monograph titled *Innovative polymer materials for covers of technological machines*, 6 publications, chapter in multi-author monograph and 3 patents.

List of publications comprising scientific achievement:

1. Ubowska A., *Innovative polymer materials intended for the technological machines guards.* Wydawnictwo Uczelniane Zachodniopomorskiego Uniwersytetu Technologicznego w Szczecinie, Szczecin 2019, ISBN 978-83-7663-272-8 (25 points of MNiSW).
2. Ubowska A., Kowalczyk K., Krala G., 2018, *Injection molding of transparent polymeric materials with 9,10-dihydro-9-oxa-10-phosphaphenanthrene-10-oxide for enhanced fire retardancy*, Polimery, 7/8, 536-541 (IF_{2018} = 0,713; IF_5 = 0,785; 15 points of MNiSW).
3. Ubowska A., 2017, *Thermoplastic polymer machine guards - exploatation safety*, Zeszyty Naukowe WSOWL, 185 (3), 148-158 (8 points of MNiSW).
4. Ubowska A., 2016, *Evaluation of the usefulness of polymeric guards using thermovision measurements*, In Innovations in Polish science in the field of technical sciences. Review of current research topics (pol. Innowacje w polskiej nauce w obszarze nauk technicznych. Przegląd aktualnej tematyki badawczej), ed. Jacek Doskocz and Tomasz Janiczek, Brzeziny: Wydawnictwo Nauka i Biznes, 147-155.
5. Kowalczyk K., Spychaj T., Ubowska A., Schmidt Beata, 2014, *Industrially applicable methods of poly(methyl methacrylate)/organophilic montmorillonite nanocomposites preparation: Processes and cast materials characterization*, Applied Clay Science, 97-98, 96-103 (IF_{2014} = 2,467; IF_5 = 3,616; 35 points of MNiSW).
6. Krala G., Ubowska A., Kowalczyk K., 2014, *Mechanical and thermal analysis of injection molded poly(methyl methacrylate) modified with 9,10-dihydro-9-oxa-10-*

phosphaphenanthrene-10-oxide (DOPO) fire retarder, Polymer Engineering and Science, 54, 1030-1037 (IF_{2014} = 1,520; IF_5 = 1,575; 25 points of MNiSW).

7. Ubowska A., 2011, *Flammability and thermal stability of PMMA/montmorillonite nanocomposites*, Archiwum Spalania, 11, 189-196 (6 points of MNiSW).
8. Spychaj T., Kowalczyk K., Ubowska A., 2009, *Functional polymer materials modified with layered aluminosilicates*, Zeszyty Naukowe Politechniki Rzeszowskiej. Chemia, 263, 147-151 (2 points of MNiSW).
9. Kowalczyk K., Ubowska A., Krala G., 2015, PL219 943 *Method for modifying a poly(methacrylate methyl)*.
10. Kowalczyk K., Ubowska A., 2014, PL219 464 *Process for the preparation of polymers of methyl methacrylate with high thermal stability*.
11. Kowalczyk K., Ubowska A., Krala G., 2014, PL218 001 *Method for modifying the polystyrene*.

Significant, original contribution to science in the scientific discipline **Machine Design and Maintenance** of presented achievement is **the development of construction materials for machine guards, characterized by good strength properties affecting the durability and safety of their use, resistant to physical and chemical factors, with improved thermal properties. The use as modifier of the phosphorus fire retardant - 9,10-dihydro-9-oxa-10-phosphaphenanthrene-10-oxide (DOPO), not used to modify thermoplastic polymers, allowed to obtain a new functionality of technological machine polymeric guards and therefore allowed to increase the safety of their operation.**

4.2. Discussion of the scientific goal and the results achieved, together with a discussion of their possible use

The use of machines carries risks for human life and health. Employees are exposed to harmful factors, the impact of which can lead to illnesses and traumas. Among the factors present in the work process, there are two dominant groups:

a) physical factors, which include noise, vibration, microclimate, optical radiation;
b) chemical factors, including toxic, irritating, carcinogenic or sensitization substances.

According to the Labor Code, the employer is obliged to protect employees against dangerous and harmful factors occurring in the work environment. To limit their impact on the employee, machines are equipped with technical security measures which include machine guards. In

shipbuilding, technological machines that require the use of guards are the equipment of repair ships on which welding works, machining and ship equipment repairs are carried out.

My **research concerned the use of technological machine guards, their role, design and properties enabling their operation in difficult conditions, especially at high temperatures**.

Fixed or movable guards are one of the elements that make it possible to secure a workplace. They constitute a barrier protecting against contact with moving machine parts, hot surfaces or operating fluids. The safety of the machine operator depends on their proper design, construction and selection. The most important aspect related to the construction of covers is the proper selection of materials for their implementation. Shields should be above all durable, thermally stable, cheap, easy to clean and resistant to industrial conditions and transparent, if observation of the shielded machine element or process is required. The main **scientific and research purpose of my work was to search for materials for the construction of guards, characterized by good strength properties affecting the durability and safety of their use, resistant to physical and chemical factors, with improved thermal properties.** The use of such materials for the production of guards would result in their increased stability and safety in use. Taking into account the goal set out above, the following **research tasks** were distinguished:

- **the modification of selected thermoplastic polymers,**
- **testing the mechanical properties of modified polymers,**
- **testing the rheological properties of modified polymers,**
- **testing heat resistance, thermal stability and flammability of modified polymers,**
- **testing chemical resistance of modified polymers,**
- **the assessment of optical properties of modified polymers,**
- **the assessment of the possibility of using modified polymers in the construction of technological machine guards**.

Among the thermoplastic polymers used to produce guards, polycarbonate is the most important. Easy workability, transparency and high durability make it a great material for machine guards. There are also general-purpose polycarbonate varieties available on the market as well as others designed to withstand food contact (machine guards in the food industry). It is difficult to find polymers that can compete with them in the context of the present application. Other thermoplastics that can be used as guard screens are poly(methyl methacrylate) and polystyrene. They are cheaper than polycarbonate. Due to their high transparency ($\geq 90\%$), it is possible to use them in the construction of guards which require observation of processes

carried out by shielded machines [3, 4]. In order for these polymers to meet the condition of thermal stability and resistance to flame, it is necessary to modify them to improve thermal properties and reduce flammability [1]. This can be achieved thanks to their modification with fire retardant. Work on obtaining modified thermoplastic polymers was carried out in cooperation with employees of the Faculty of Chemical Technology and Engineering, West Pomeranian University of Technology, Szczecin. It concerned both modifications of thermoplastics in the processing and *in situ* polymerization. In the first research stage montmorillonite, belonging to the layered aluminosilicate group, was used as a modifier. As can be seen from the review of the literature data, it has proven itself as a flame retardant for polyurethane foams as described in the article [12] (Annex 4, point II.3.2). The disadvantage of materials modified with montmorillonite [5, 6, 8] was a reduced transparency, therefore the search for another modifier was commenced. Based on literature research, I selected 9,10-dihydro-9-oxa-10-phosphaphenanthrene-10-oxide (DOPO), belonging to the group of phosphor fire retardants [1, 2, 6]. So far, it has not been used to modify thermoplastic polymers. **Work on the use of this fire retardant for modification of polymers resulted in the patenting of three solutions in the field of modification and preparation of innovative polymer materials**: "Method for modifying a poly(methacrylate methyl)" [9] and "Process for the preparation of polymers of methyl methacrylate with high thermal stability" [10] and "Method for modifying the polystyrene" [11]. **The advantage of the obtained materials is the increased volumetric flow rate index, i.e. significantly improved processing properties**. Furthermore, the addition of the modifier reduces the softening temperature and glass transition of materials.

The literature data show that the introduction of an inorganic modifier often results in a significant deterioration of the strength parameters. As results from the tests carried out show, the strength properties of the obtained materials do not differ significantly from the properties of unmodified polymers, especially if the DOPO content does not exceed 7.5 wt. parts per 100 wt. parts of polymer [1, 2, 6].

An important element of the research was the assessment of the thermal properties of modified thermoplastics at higher temperatures. For this purpose, the following was examined:

– thermal resistance defining reversible changes in the physical properties of the polymer occurring due to heating,

– thermal stability related to irreversible changes in the polymer structure due to temperature increase,
– flammability.

The most important change concerns the impact of the presence of DOPO on the behavior of materials in contact with the flame and hot surface. DOPO modified materials have a higher temperature of inflammation and a higher oxygen index. The more flame-resistant materials are those based on polystyrene (PS), for which the values of these parameters are higher, and the area of combustion of samples after contact with the flame is the smallest. Polymer materials modified with DOPO are characterized by slightly lower values of loss temperatures of 10 and 50% of the sample mass than their unmodified equivalents, the temperature of the beginning of the plastics decomposition being close to the beginning temperature of the reference polymers [1, 2].

Plastic covers are used in all of production and processing, so it should be remembered that in conditions of their use they may have contact with liquid process media, operating fluids, oils and greases. They may, as a result of contact with the shield, dissolve the cover material, cause it to swell and deteriorate its optical properties. The chemical resistance test showed that polystyrene materials are characterized by greater inertness in relation to the liquids used than poly(methyl methacrylate) (PMMA) based compositions. It is necessary to limit the contact of the first of them with acetone and toluene, under the influence of which they dissolve. Also, do not use petroleum ether for cleaning polystyrene components, because it causes them to swell, cloud and lose their transparency. Significant reduction in the transparency of polystyrene materials is also caused by contact with methanol. Polymethacrylate materials are also dissolved in acetone and toluene. In addition, immersed in liquids such as water, aqueous solutions of nitric (VI) and sulfuric (VI) acids and detergents as well as petroleum ether absorb them (up to 0.4% by weight). Their swelling, opacity and loss of transparency cause immersion in methanol. Among the liquids used to test chemical resistance, the biggest decrease in the transparency of polymethacrylate materials was caused by a solution of sulfuric acid (VI) [1].

Polymers modification causes a change in their transmittance in the range of radiation with wavelengths of 200 ÷ 1000 nm. Materials with the addition of DOPO do not transmit UV radiation; they also transmit less infrared radiation than unmodified PS and PMMA, thus reducing the thermal radiation transmission. New compositions (in particular polystyrene with a DOPO share of 10 wt. parts per 100 wt. parts of polymer) are also characterized by lower visible transmission, which may limit their use as transparent covers [1].

Test results showed that the modified materials can be used in the construction of machine guards operated in conditions of higher temperatures.

4.3. Summary - elements of scientific novelty

One of the main distinguishing features of my research in the field of obtaining and characterising DOPO modified thermoplastic polymeric materials for the construction of technological machine guards is the possibility to implement its results in the industry, as well as shipbuilding (construction of machine guards for repair ships). It also contains the following aspects of scientific novelty:

- assessment of threat from chemical substances in technical environment,
- determination of the impact of chemical substances during their emergency release from tanks and transport equipment;
- assessment of the possibility of using natural and synthetic sorbents to remove spills of chemical substances;
- discussion of the possibility of flame retarding of thermoplastic polymers;
- determination of the effect of montmorillonite on the PMMA flammable properties;
- determination of the impact of DOPO on mechanical, thermal, flammable, optical, barrier properties (against UV-VIS radiation and chemical substances) of selected thermoplastic polymers;
- assessment of the possibility of using PMMA/DOPO and PS/DOPO compositions in the construction of technological machine guards.

5. Discussion of other scientific and research achievements

5.1. The activity carried out before the doctorate

In 1998, I graduated from the Environmental Protection Technical School in Pila. The same year, I started my Master's degree in Environmental Protection (specialization: technologies for environmental protection and ecological materials) at the Faculty of Chemical Technology and Engineering, Technical University of Szczecin. **In 2003, I obtained a master's degree in engineering by submitting my diploma thesis entitled "Solvent-free UV-crosslinked pressure-sensitive adhesives based on polyacrylate", which was supervised by prof. dr hab. inż. Zbigniew Czech.** The results of the work are included in the publication:

1. Czech, Z., Klementowska, P., Drzycimska, A., 2007, *Choosing the right initiator - Improved performance of UV-crosslinking pressure-sensitive adhesives*, European Coatings Journal, 2, 26-30.

During my master's studies (academic year 2001/2002) I was a participant in the Pedagogical study at the Technical University of Szczecin.

In 2003, I started the Doctoral Studies at the Faculty of Chemical Technology and Engineering, Technical University of Szczecin. **The aim of my scientific and research work carried out at the Institute of Polymers was the synthesis and characterization of hybrid hydrophilic acrylamide copolymers and testing their flocculation efficiency**. The use of a layered aluminosilicate nanoparticle modifier allowed the receiving of hybrid materials such as polymer chain/inorganic particle. The copolymerization reactions of acrylamide with cationic monomers: diallyldimethylammonium chloride and [2-(acryloyloxy) ethyl] trimethylammonium chloride were conducted in the presence of sodium montmorillonite (1-5% by weight), the structure of which allows the exchange of sodium cation to organic ammonium cation and electrostatic interaction between the negatively charged surface of the layered mineral tile and the polymer chain endowed with a positive charge. Polymer materials were obtained by the following polymerization: (i) a microsuspension conducted in a glass reactor and (ii) a "thin layer" method in a concentrated aqueous monomer/monomer solution. Polymer hybrid materials were subjected to basic physicochemical tests, i.e. changes in the limit viscosity numbers (capillary viscometry), changes in the infrared spectrum (FTIR), the amount of unreacted monomer in selected (co)polymerization products (gas chromatography), medium molecular weights (double-detection gel chromatography) and the determination of thermal characteristics (DSC). Research on hybrid hydrophilic acrylamide copolymers intended for water and sewage management was aimed at assessing the flocculation efficiency of a new category of polymeric materials based on tests carried out on model aqueous suspensions of talc, silica and fine coal. The presence of montmorillonite in acrylamide hybrid copolymers influenced the reduction of viscosity limits, however, the flocculation properties of the products did not diverge, and in some cases (coal fines) were better than the properties of unmodified (co)polymers. The results of research carried out by me as part of my doctoral dissertation were presented in the following articles (published under my maiden name):

1. Drzycimska A., Spychaj T., 2008, *Hybrid hydrophilic polymer/montmorillonite systems*, Polimery, 53, 169-175.

2. Drzycimska A., Spychaj T., 2008, *Flocculants based on the montmorillonite modified cationic copolymer of acrylamide*, In conference materials: 4th International Symposium on Nanostructured and Functional Polymer-based Materials and Nanocomposites, Rome, Italy, 206-209.
3. Drzycimska A., Schmidt B., Spychaj T., 2007, *Modified acrylamide copolymers as flocculants for model aqueous suspensions*, Polish Journal of Chemical Technology, 9, 10-14.
4. Drzycimska A., Spychaj T., 2007, *Organo/inorganic acrylamide cationic flocculants*, In conference materials: Polymeric materials, Pomerania-Plast 2007, Szczecin – Kołobrzeg, 77-78.
5. Schmidt B., Drzycimska A., Spychaj T., 2007, *Flocculation in colloidal silica suspensions induced by a new modified acrylamide polymers*, In Courrent Trends in Commodity Science Vol. 1, ed. Zieliński R., Wydawnictwo Akademii Ekonomicznej w Poznaniu, Poznań, 577-581.
6. Drzycimska A., Spychaj T., 2006, *Estimation of the aluminum salt effect on homopolymerization of acrylamide and its copolymerization with acrylic acid by DSC*, Polimery, 6, 460-463.

The results of the research were also presented as part of national and international conferences:

1. Drzycimska A., Spychaj T., 2008, *Flocculants based on the montmorillonite modified cationic copolymer of acrylamide*, 4th International Symposium on Nanostructured and Functional Polymer-based Materials and Nanocomposites, Rzym, Włochy.
2. Drzycimska A., Schmidt B., Spychaj T., 2007, *Modified acrylamide copolymers as flocculants for model aqueous suspensions*, VII Conference. Non-waste Technologies and Waste Management in Chemical Industry and Agriculture, Międzyzdroje.
3. Schmidt B., Drzycimska A., Spychaj T., 2007, *Flocculation in colloidal silica suspensions inducted by a new modified acrylamide polymers*, 9th International Commodity Science Conference, Poznań.
4. Drzycimska A., Spychaj T., 2007, *Organo/inorganic acrylamide cationic flocculants*, In conference materials: Polymeric materials, Pomerania-Plast 2007, Szczecin – Kołobrzeg
5. Drzycimska A., Schmidt B., Spychaj T., 2006, *Copolyacrylamide anionic hybrid flocculants*, V Congress of Chemical Technology TECHEM, 5, Poznań.

6. Drzycimska A., Schmidt B., Spychaj T., 2006, *(Co) polyacrylamide nanohybrid flocculants*, VIII Conference. Preparation, application and analysis of aqueous dispersions and polymer solutions, Szczyrk.

During my doctoral studies I took part in two research projects: N205 067 32/3784 "Hybrid acrylic flocculants" and PBZ-KBN-095/T08/2003 "Polymer materials with the participation of mineral and synthetic mineral nanofillers".

In the period from April to October 2008, I was employed as a senior technical clerk at the Polymer Institute (Faculty of Chemical Technology and Engineering, Technical University of Szczecin).

In December 2008, pursuant to the decision of the Council of the Faculty of Chemical Technology and Engineering of the Technical University of Szczecin, **I received my PhD degree with distinction upon presenting my doctoral thesis "Hybrid hydrophilic acrylamide copolymers", conducted under the supervision of prof. dr hab. inż. Tadeusz Spychaj.**

5.2. Activities carried out after doctoral studies

In December, 2009 I have been employed as an assistant professor in the Department of Safety and Power Engineering (in the years 2009 to 2013 Department of Ship Safety Engineering) at the Faculty of Maritime Technology and Transport, West Pomeranian University of Technology, Szczecin.

After obtaining a PhD degree in technical sciences, four publications were published that covered the subject of previous research:

1. Ubowska A., Spychaj T., Paździoch W., 2011, *Thin-layer synthesized acrylamide copolymers modified with montmorillonite. Flocculation efficiency evaluation*, e-Polymers, 52, 1-13.
2. Ubowska A., Spychaj T., 2010, *Cationic acrylamide copolymers and terpolymers as flocculants for model aqueous suspensions*, Polimery. 55, 299-305.
3. Ubowska A., Schmidt B., 2010, *Polymeric flocculants for inorganic model suspensions* In Polymeric materials, ed. Tadeusz Spychaj, Stanisława Spychaj, Szczecin: Wydawnictwo Uczelniane Zachodniopomorskiego Uniwersytetu Technologicznego w Szczecinie, 691-694.

4. Schmidt B., Ubowska A., 2009, *Grafted starch and polyacrylamide copolymers - a comparative analysis of flocculating properties*, In VI Congress of Chemical Technology: congress materials, Vol. 2, Zakład Wydawniczy CHEMPRESS-SITPChem, 117-118.

Employment at the Faculty of Maritime Technology and Transport has changed my scientific and research interests, and my scientific activity focused on the safety of operation of technical equipment, including technological machines and tanks. **My scientific activity (apart from that described in item 4) concerns threats from chemical substances in the technical environment which result from the use of chemicals in processing and production processes and the use of operating fluids (e.g. in marine engine rooms) including refrigerants, lubricants or solvents.** These issues were discussed in the following publications:

1. Ubowska A., 2018, *Environmental hazard related to a rail accident of a tanker transporting the ammonia*, Zeszyty Naukowe SGSP, 66 (2), 51-63 (7 points of MNiSW).
2. Ubowska A., Kotrys M., 2016, *Hazards during the storage of sulfuric acid in the Grupa Azoty Zakłady Chemiczne "Police" S.A.*, Prace Naukowe Akademii im. Jana Długosza w Częstochowie. Technika, Informatyka, Inżynieria Bezpieczeństwa, Tom IV, 477-489 (7 points of MNiSW).
3. Ubowska A., 2016, *Ammonia in cooling installations for the agri-food industry*, Bezpieczeństwo Pracy: nauka i praktyka, 1, 14-17 (7 points of MNiSW).
4. Ubowska A., Nazar N., 2015, *The risk assessment of safe storage of liquid ammonia. Part 2, Storage in a vessel under pressure*, Przemysl Chemiczny, 12, 2112-2116 (IF_{2015} = 0,367; IF_5 = 0,345; 15 points of MNiSW).
5. Ubowska A., Nazar N., 2015, *The risk assessment of safe storage of liquid ammonia. Part 1, Storage in a pressurized spherical tank*, Przemysl Chemiczny, 11, 1932-1935 (IF_{2015} = 0,367; IF_5 = 0,345; 15 points of MNiSW).
6. Ubowska A., 2015, *Characteristics of the risks and causes of accidents in the printing industry*, Bezpieczeństwo pracy: nauka i praktyka, 4, 22-25 (7 points of MNiSW).
7. Ubowska A., Tworek M., 2014, *Safety hazards during the production of polyester-glass laminates, In Safety engineering and civilization threats - Variability of threats and innovations in emergency services* (pol. Inżynieria bezpieczeństwa a zagrożenia cywilizacyjne - Zmienność zagrożeń a innowacje w ratownictwie, ed. Anna Gil, Urszula Nowacka, Marek Chmiel, Częstochowa: Centralna Szkoła Państwowej Straży Pożarnej, 237-247.

8. Ubowska A., Niewińska E., 2014, *Safety in the auto paint shops – the threat of chemical substances*, Logistyka, 5, 1596-1606 (10 points of MNiSW).
9. Ubowska A., Kot R., 2013, *The potential impact of an accident involving a tanker transporting ammonia, In Safety engineering and civilization threats - Safety challenges* (pol. Inżynieria bezpieczeństwa a zagrożenia cywilizacyjne - Wyzwania dla bezpieczeństwa), ed. Alina Gil, Urszula Nowacka, Marek Chmiel, Częstochowa Centralna Szkoła Państwowej Straży Pożarnej, 231-242.

In my papers I presented the threats from chemical substances in engine rooms and various, broadly defined branches of industry. In the publications above, I pointed out solutions that affect the reduction of the impact of these substances on the environment. The greatest risk associated with the emission of chemical substances to the environment concerns damage to storage tanks, both industrial and transport. In my scientific research, I paid particular attention to two chemical products, i.e. ammonia and sulfuric acid (VI). In both of these cases the danger associated with the release of chemical substances is primarily related to the products' toxicity. In order to predict the impact of chemical agents on the environment, programs for creating a dispersion model of chemical pollutants in the air are used. One such program, used to assess the risk of release of dangerous chemical substances in the form of vapors/gas into the atmosphere, is the commercial ALOHA program that allows to estimate the chemical cloud diffusion based on toxicological and physico-chemical properties. **As part of the conducted research, I analyzed both the uncontrolled release** of these **substances from reservoirs located on the site as well as from storage tanks used in road and railway transport.** The range of contamination as well as the area of combustible gas clouds depend on the place of release, filling and atmospheric conditions. Based on the analyses carried out, **I presented how tragic the consequences may be if these devices are damaged and how important it is to ensure their safe operation**.

In emergency situations, technological and transport devices may be the source of unforeseen releases of operating fluids and transported chemical products. Emergency spills of substances of chemicals are among the most common causes of environmental pollution. Chemicals spread in the environment relatively quickly, creating huge areas of contamination. That is why it is so important to quickly and effectively remove them from the place of the leak. The simplest and most common way to remove spills is to use sorbents. When selecting the sorbent, the most important parameter should be its absorbency in relation to the impurity removed. **As part of the research I was looking for sorbents that effectively collect liquid**

impurities from hardened surfaces. The study included the assessment of the absorbency of selected natural and synthetic sorbents with respect to such products as sulfuric acid, nitric acid, phosphoric acid, acetone, toluene and engine oil. I presented the results in the following publications:

1. Ubowska A., Jowtuch K., 2018, *On deck oil spill clean-up materials – solution for engine rooms,* New Trends in Production Engineering, 1 (1), 11-18.
2. Ubowska A., Laskowska K., 2016, *Sorbents as a agents to prevent hazards in road transport caused by incidental spills of chemical substances*, In Safety engineering and civilization threats, CBRNE threats (pol. Inżynieria bezpieczeństwa a zagrożenia cywilizacyjne, Zagrożenia CBRNE, ed. Alina Gil, Urszula Nowacka, Jan Kołdej, Częstochowa: Centralna Szkoła Państwowej Straży Pożarnej,109-122.

The conducted research shows that the majority of mineral and synthetic sorbents available on the market are characterized by much lower absorption than common and inexpensive sawdust.

Furthermore my scientific activity concerns issues related to safety engineering (in particular fire safety), resulting in publications:

1. Ubowska A., 2018, *Reduction of greenhouse gases emissions from ships – ammonia as fuel of the future,* Zeszyty Naukowe Akademii Morskiej w Gdyni, 108, 143-152.
2. Ubowska A., Szczepanek M., 2016, *Engine rooms fire safety – fire-extinguishing system requirements*, Scientific Journals of the Maritime University of Szczecin, 48 (120), 51–57.
3. Ubowska A., Laskowska K., 2016, *Forest fires - methods of forecasting and prevention*, Aura, 1, 10-13.
4. Ubowska A., Dobrzyńska R., 2015, *Stadium seats - assessment of the fire hazard*, Logistyka, 5, 1591-1595.
5. Ubowska A., 2015, *Modern fire detection systems for passenger rolling stock*, Logistyka, 4, 6337-6344.
6. Ubowska A., Krala G., 2014, *The influence of recyclate share on usable and flammability of polyurethane flexible foams*, Archivum Combustionis, 43, 95-100.
7. Ubowska A., Łukaszewicz K., 2013, *The concept of neighborhood playground for children aged between 3-6 years, complying with safety standards*, Prace Naukowe Akademii im. Jana Długosza w Częstochowie. Technika, Informatyka, Inżynieria Bezpieczeństwa, 1, 421-432.

8. Ubowska A., 2010, *Montmorillonite as a polyurethane foams flame retardant*, Archivum Combustionis, 30, 459-462.

The result of my organizational activity in the field of monitoring and improving the quality of education was publication:

1. Ubowska A., Szczepanek M., 2015, *Lecture notes - recording and copyright*, General and Professional Education, 3, 46-51.

I presented the results of the work at national and international conferences during speeches (Annex 4, point II.7) and during poster sessions (Annex 4, point III.2). **DOPO modified thermoplastic polymers presented at the International Fair of Work Protection, Fire-Fighting and Rescue Equipment SAWO in Poznan** (2016) promoting the scientific and research potential of the Faculty of Maritime Technology and Transport, ZUT, Szczecin.

After obtaining the doctoral degree, **I took part in two national projects** (Annex 4 point II.5). The scope of my work included carrying out tests of fire characteristics of materials. In 2016, I developed "Expertise in the requirements for combustible properties of polymer materials used in rail vehicles in the light of current legislation" for New Era Materials Sp. z o.o.

In the period 1.12.2013- 28/02/2014 **I completed a scientific and industrial internship** at "Wilhelmsen Technical Solutions Sp. z oo " in Stobno **as part of the project "Time for internship II - diffusion of knowledge between the university and business"** (Human Capital Operational Program, priority VIII Regional staff of the economy, Measure 8.2 Transfer of knowledge, Submeasure 8.2.1 Support for cooperation between science and enterprises).

My current scientific achievements include 39 papers, 32 of which were written after receiving my PhD degree in technical sciences. A total of 25 publications, including 22 post-doctoral, have been published in peer-reviewed foreign and national journals, 10 of which in journals indexed in the Web of Science database. The total IF is 7.086 (5.949 after PhD studies) in accordance with the year of publication, and the Hirsch index is 3. The total number of MNiSW points, consistent with the year of publication, is 309. The aggregated data (as of 05/02/2019) is shown in tables 1-4.

Table 1. Indicators for the assessment of scientific achievements

Indicators for the assessment of scientific achievements			
Data source	Web of Science	Scopus	Google Scholar
H-index	3	4	4
The number of total citations	25	27	37
Number of publications in the database	10	8	30

** articles published under the maiden name were included*

Table 2. Publications in journals from the Journal Citation Reports (JCR) database with Impact Factor (IF)

Journal (wg JCR)	**Year of publication**	**Impact Factor (according to the year of publication)**	**5-Year Impact Factor**	**MNiSW points (according to the year of publication)**
Before obtaining a PhD degree				
Polimery	2006	1,137	0,785	15
Polish Journal of Chemical Technology	2007	0	0,655	6
Polimery	2008	0	0,785	20
After PhD studies				
Polimery	2010	0	0,785	27
e-Polymers	2011	0,515	0,841	27
Polymer Engineering and Science	2014	1,520	1,575	25
Applied Clay Science	2014	2,467	3,616	35
Przemysl Chemiczny	2015	0,367	0,345	15
Przemysl Chemiczny	2015	0,367	0,345	15
Polimery	2018	0,713	0,785	15
Total Impact Factor		**7,086**	**10,517**	**200**

Table 3. Publications in journals indexed in the Web of Science database without IF

Journal (according to WoS)	**Year of publication**	**MNiSW points (according to the year of publication)**
Scientific Journals of the Maritime University of Szczecin	2016	8
Total		**8**

Table 4. Summary of publications in journals scored by MNiSW

Journal	Year of publication	MNiSW points (according to the year of publication)
Zeszyty Naukowe Politechniki Rzeszowskiej. Chemia	2009	2
Archivum Combustionis	2010	6
Archiwum Spalania	2011	6
Prace Naukowe Akademii im. Jana Długosza w Częstochowie. Technika, Informatyka, Inżynieria Bezpieczeństwa	2013	7
Archivum Combustionis	2014	12
Logistyka	2014	10
General and Professional Education	2015	9
Bezpieczeństwo pracy: nauka i praktyka	2015	7
Aura	2016	6
Bezpieczeństwo Pracy: nauka i praktyka	2016	7
Prace Naukowe Akademii im. Jana Długosza w Częstochowie. Technika, Informatyka, Inżynieria Bezpieczeństwa	2016	7
Zeszyty Naukowe WSOWL	2017	8
Zeszyty Naukowe SGSP	2018	7
Zeszyty Naukowe Akademii Morskiej w Gdyni	2018	7
Total		**101**

6. Didactic and organizational activity

6.1. Conducted courses and supervision of students

My didactic activity is related to the area of my interests, scientific research and practical experience. The subject of lectures concerns issues related to the broadly understood concept of safety in the technical environment and material science. I conduct classes for all courses of studies at the Faculty of Maritime Technology and Transport, ZUT, Szczecin: Safety Engineering (1st degree), Transport (1st and 2nd degree), Ocean Technology (1st degree), Yacht Building (1st degree) and Refrigeration and Air Conditioning (1st degree).

As part of my didactic activity, I have been conducting and/or currently conducting classes in the following subjects (Annex 4, III.6.1-III.6.3):

- Safety of technical equipment operation,
- Quantitative and qualitative methods of risk assessment 1,

- Quantitative and qualitative methods of risk assessment 2,
- Safety of chemical processes,
- Flood and environmental protection,
- Materials science and manufacturing techniques,
- Materials engineering,
- Utilization of waste and packaging,
- Protection of information,
- HSE,
- Semester Project.

In 2018, the Faculty obtained permission to launch another field of study under the name of Logistics. For this field I have been working on the content of the following subjects:

- Security techniques for logistics facilities,
- Information flow in the supply chain,
- Protection of information.

I have promoted 24 graduates (Annex 4 point III.6.5), one more engineering work will be submitted in February 2019. **I was a reviewer of 34 engineering and master's works** (Annex 4, point III.6.6). Currently, **I am the supervisor of two master's theses** (Annex 4 point III.6.4).

I am the auxiliary promoter of the PhD thesis titled "Experimental studies on the impact of ship movement on pneumatic transport of solid fuel to the boiler" (Annex 4 point III.7). I was a member of the English PhD Examination Committee.

In the years 2014-2016, **I was the coordinator of the first year students of Safety Engineering**.

6.2. Improving the learning process and performing organizational functions

Since the beginning of employment at the Faculty of Maritime Technology and Transport, I have been involved in shaping the plan and curriculum of the first-degree full-time studies under the name Safety Engineering. **I participated in the implementation of the Bologna Process by adapting education programs to the requirements resulting from the National Qualifications Framework for Higher Education**. Since 2012, **I have been actively involved in the activities of the Program Committee for the field of Safety Engineering**. The committee's activities focus on monitoring the implementation of didactics

in the field of study, periodic reviews and verification of the study plan and curriculum as well as giving opinions on proposed changes to the study plan and educational program. **I am responsible for making changes to the KRK Sylabus program. Since 2015, I have been the secretary of the Commission.** In 2015/2016 **I took part in the work of a team established to develop projects for modification of education programs for the field of study: Safety engineering**.

Since 2012 **I have been actively involved in the work of the Faculty Committee for Education Quality**, dealing with the implementation of the Quality Assurance System at the Faculty of Maritime Technology and Transport. In the years 2015-2016, **as the chairperson** of the commission, I took part in the work of the University Committee for the Quality of Education. I am **currently the secretary of the faculty commission**. **I am** also a **member of the Faculty Recruitment Commission for full-time studies** and a **representative of the electors of the Faculty Electoral College from the group of other teachers** from the Faculty of Maritime Technology and Transport, West Pomeranian University of Technology, Szczecin (term 2016-2020). **I am a delegate from the group of other teachers** from the Faculty of Maritime Technology and Transport, West Pomeranian University of Technology, Szczecin **for the Academic meeting to the Senate** of the West Pomeranian University of Technology (term 2016-2020).

Since 2015, I hold a position of head of the Safety Engineering Team at the Department of Safety and Energy Engineering at the Faculty of Maritime Technology and Transport, West Pomeranian University of Technology, Szczecin. I am a **member of the National Section for Environmental Protection MEPC International Maritime Organization** (IMO), **member of the Polish Scientific and Technical Society for Exploitation** (Polskie Naukowo-Technicznego Towarzystwo Eksploatacyjne) and a **member of the Polish Institute of Combustion** (Polski Instytut Spalania).

In the years 2012-2016, I was a member of the department for the development of the faculty strategy. In subsequent years (from 2014), I monitored its implementation as a member of the Commission for monitoring and evaluation of the implementation process of the Faculty of Maritime Technology and Transport Development Strategy.

I was twice (before obtaining a doctoral degree) a **member of the organizing committee** of national scientific conferences from the series **"Polymeric Materials - Pomerania-Plast"**, and also a member of the organizing committee of the Symposium of the ship power plants **SymSO 2017**. In 2010, I was the **secretary of the international conference**

"XXI-st International Symposium on Combustion Processes". I was a member of the Organizational Committee of the 20th anniversary celebrations of the Faculty of Maritime Technology and Transport (2012).

6.3. Raising own competences

In my professional development, participation in trainings and conferences related to safety engineering was of particular importance. I took part in the following conferences, seminars and symposia:

- I International Science and Technology Conference Technical Safety "ICTS – 2014", 2014, Wrocław,
- II International Science and Technology Conference Technical Safety "ICTS – 2015", 2015, Warszawa,
- III International Science and Technology Conference Technical Safety "ICTS – 2016", 2016, Wrocław,
- IV Science and Technology Conference Technical Safety "ICTS – 2017", 2017, Warszawa,
- III International Scientific Conference "Safety engineering and civilization threats. Variability of threats and innovations in emergency services", 2014, Częstochowa,
- IV International Scientific Conference "Safety engineering and civilization threats. CBRNE threats", Częstochowa, 2016,
- II National Scientific Conference "Technology Progress" with innovative thermal imaging Workshop, 2016, Wrocław,
- International Scientific Conference "XXI-st International Symposium on Combustion Processes", 2010, Międzyzdroje,
- Scientific Conference "Polymeric Materials Pomerania - Plast 2016", 2016, Międzyzdroje,
- XXXVII Symposium "SymSO 2017", 2017, Szczecin,
- XXXVIII Symposium "SymSO 2018", 2018, Gdynia

and courses:

- Fire Alarm Aspirating sensing Technology and PIPEIQ LT software tool to deliver EN54-20 compliant very early stage smoke detection solutions to a broad range of

challenging applications, organized by ADI Global – Ultrak Security Systems, 2014, Szczecin,

- Designing fire alarm systems based on the sensor system FAAST/FAAST LT from System Sensor, organized by ADI Global - Ultrak Security Systems, 2015, Szczecin.

A significant professional experience was a three-month internship at Wilhelmsen Technical Solutions Sp. z o.o. During my stay I became acquainted with the organizational structure of the company, its equipment and designing capabilities, the systems and the life cycle of the products they offered (encompassing the estimate, the installation and the service), current trends in security solutions for vessels and major issues with providing safety systems for the maritime industry.

I gained my competences in obtaining funds for research and cooperation, including international training during the **internship at the University of Zilina (Slovakia) as part of the Erasmus + program** (2016) as well as training courses on principles of implementing new technologies (2013) and Good dialogue - effective management (2014) organized by the Regional Centre for Innovation & Technology Transfer ZUT, Szczecin.

An important place among my interests is occupied by quality and safety management. I have the authority of internal auditor, which I obtained and expanded participating in the following courses and training:

- Management system at the Laboratory according to ISO/IEC 17025. Responsibility and responsibilities of the Quality Manager, technical management and internal auditor, 2013, Institute for Quality Managers' Training, Kraków.
- Internal Audit of the Highest Management, POLLAB, 2013, Warszawa.
- New requirements of DAB-07 "Accreditation of research laboratories. Specific requirements " issue 10 of 16/10/2013 - research in the legally regulated area, 2013, CE2 Centrum Edukacji, Wrocław.
- Occupational risk assessment, 2017, PortalBHP.pl.
- RODO - the most important challenges for companies, 2018, Wiedza i Praktyka Sp. z o.o.

6.4. Awards and distinctions

So far, I have been awarded the Rector of the West Pomeranian University of Technology, Szczecin, Szczecin for scientific achievements three times. In 2018, the Rector of

the West Pomeranian University of Technology in Szczecin awarded me a habilitation scholarship.

For the promotion of the University, I received the Rector's Prize in Szczecin and the Dean of the Faculty of Maritime Technology and Transport (Annex 4, point III.4).

Regional Centre for Innovation & Technology Transfer ZUT, Szczecin saw the commercial potential of the materials patented by me and distinguished them by financing a development strategy (under the project UDA-POKL.08.02.01-32-040/11-00, "Time for internship II - Diffusion of knowledge between the university and business"). I acted as a consultant during the development in 2014 by CoWinners of the document "Strategy for the implementation of methods for the modification of polystyrene and the modification and production of poly (methacrylate) methyl in order to reduce their flammability".

6.5. Popularization of science

I take active part in popularizing science during events: European Researchers 'Night (2018), Researchers' Power (2018), Science Festival (2011, 2013, 2016). During these events, we present our research in the form of workshops and demonstrations. In 2017, I was actively involved in the implementation of the MNiSW project "Support for Universities of the Third Age" by conducting classes for Third Age Universities from the Westpomeranian Region.

I promoted the scientific and research potential of the Faculty of Maritime Technology and Transport at ZUT in Szczecin at the International Fair of Work Protection, Fire-Fighting and Rescue Equipment SAWO in Poznan (2016). I explained ways to reduce the flammability of thermoplastics by presenting patented materials.

7. Achievements in accordance with the requirements of the Ordinance of the Minister of Science and Higher Education of September 1, 2011 on the criteria for assessing the achievements of the person applying for the doctor habilitated degree

Criterion according to § 3 p. 4, § 4 and § 5 of the Regulation	Fulfillment of the criterion	Total Number
Scientific publications in journals from the Journal Citation Reports (JCR)	Yes	7
Granted patents, international and national patent applications	Yes	3
Inventions that have been issued at international or national exhibitions or fairs	Yes	1
Monographs, scientific publications in journals other than those contained in the JCR database	Yes	27
Total Impact Factor according to Journal Citation Reports (JCR), according to the year of publication/(after PhD studies*)	Yes	7,086/5,949*
The number of citations according to Web of Science (WoS)	Yes	25
H-Index according to Web of Science (WoS)	Yes	3
International and national awards for scientific or artistic activity	Yes	8
Presentation of papers at international and national conferences	Yes	3
Active participation in scientific conferences: a) international b) national	Yes	 6 3
Participation in European programs and other international and national programs	Yes	2
Participation in organizational committees of scientific conferences: a) international b) national	Yes	 1 1
Received awards and distinctions other than those mentioned above	Yes	4
Membership in international and national organizations and scientific societies (by election)	Yes	3
Scientific care for PhD students as an auxiliary supervisor	Yes	1
Internships in academic or foreign academic centers	Yes	1
Made expertise or other studies on request	Yes	1
Reviewing publications in national journals	Yes	1
Promoting engineering/master's theses	Yes	27

A detailed list of habilitation achievements has been included in Appendix 4 to the application for the conduct of habilitation proceedings.

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Agnieszka Ubowska